SPECIFICATIONS FOR PUMPING MACHINERY AND MODE OF TESTING THE SAME.

The Water Commissioners of the city of Buffalo, desiring to increase the pumping capacity of the City Water Works, by from fifteen to twenty-five millions of gallons per day, invite proposals, as follows:

First. For a pumping engine, boilers, chimney and foundations complete, having a capacity of not less than fifteen millions of U. S. gallons of water in 24 hours; to be pumped against a pressure of 80 pounds per square inch; said pressure to be indicated by a pressure gauge, to be placed upon the engine, and connected with the delivery pipe thereof, in said pumping house.

Second. For a pumping engine, or pumping engines, with boilers, chimney and foundations complete, having a capacity of from twenty to twenty-five millions of U. S. gallons of water in 24 hours to be pumped against a pressure of 80 pounds per square inch; said pressure to be indicated by a pressure gauge, to be placed upon the engine and connected with the delivery pipe thereof in said pumping house. In neither case shall the center of said pressure gauge be less than five feet or more than twelve feet above the floor of the engine-room.

The chimney and boiler settings to be of the best quality of stock and hard burnt brick.

The shells of the boilers are to be constructed of the best C. H. iron. The fire-boxes, and all the parts coming in contact with the fire, are to be made of the best extra fire-box iron.

The holes for rivets must be accurately spaced and carefully drilled or punched with a punch, having but little taper, and all holes requiring it to be reamed with a reamer and not drawn with a drift.

No plans will be considered which are experimental. The competition between designs will be confined to those of known and approved forms, such as may be seen in operation as pumping engines of reasonable size, and which can point to a record of performance. Nor will a design be accepted simply because certain results are guaranteed irrespective of considerations of simplicity, durability, and liability to accidents which, duly considered, might, in the opinion of the commissioners, justify their rejection. Beyond this the design is left to the builder.

The Board of Water Commissioners will decide upon the engine or pumping capacity to be adopted after the proposals shall have been submitted and duly examined; reserving, however, the right to reject any or all bids in case the interest of the city of Buffalo shall seem to require such rejection.

The Water Commissioners will make all necessary earth excavations required for the engine and chimney foundations, and may at their option build the foundations, in accordance with approved plans and specifications, which, together with an estimate of the cost of said foundations, shall be furnished by the bidder, who shall also furnish, in case the contract shall be awarded to him, all anchor plates, holding-down bolts and a template, upon which shall be located all of said holding-down bolts, without extra charge.

The foundations for the engine and chimney will be built upon the rock-bed, which will be not more than seven feet below the floor of the engine-room.

Each proposal must be accompanied by a general plan and complete specifications of the engine, boilers and appliances proposed to be furnished, together with such detailed plans and sections of the steam and pump cylinders, valves, boilers, chimney and foundations for engine and chimney as may be necessary to enable the commissioners to thoroughly comprehend the same, and to form an intelligent and satisfactory judgment as to the relative merits of the plans submitted.

No plan or proposal will be considered by the Water Commissioners unless it shall be accompanied by a bond in the sum of twenty-five thousand dollars with two acceptable sureties, residents of the State of New York, which said bond shall be conditioned upon the full and faithful completion of the work specified—in case an award shall be made—in accordance with all the specifications; also by a bond, in the sum of fifteen thousand dollars with two acceptable sureties, residents of the State of New York, indemnifying the city of Buffalo against any and all claims for damages or royalty on account of the use of any patent or patented appliances which may be used in the proposed machinery, or which does not conform to the following requirements:

1. The engine must be compound, condensing and of approved design.

2. The piston speed, when the engine is running at its guaranteed capacity and developing its guaranteed duties, together with the steam boiler pressure to be employed, must be stated.

3. Each proposal must state the capacity and duties which will be guaranteed under the conditions hereinafter specified, and the price for which the proposed pumping engine—or engines—together with their necessary connections, attachments and appliances, as specified, will be furnished; said price to include compensation for the construction, delivery, erecting and connecting the engines and pumps, including suction and delivery pipes and the connection of the latter with the force main; for furnishing and connecting a suitable check-valve in the delivery pipe; for all gauges—steam, vacuum and water—a counter, fire-tools, oilers, steam tube-cleaner and all other usual and necessary tools and appliances, for adjusting the machinery and putting it in successful and satisfactory operation, and for maintaining the same in good repair for a period of one year from the date of its acceptance by the Water Commissioners.

In the proposals submitted for boilers, chimney and foundation, a separate price shall be named for each, which shall also include all compensation for the construction, delivery, setting, connecting and putting the same in successful operation, and for furnishing all steam gauges, gauge-cocks, water-glasses, safety-valves and other usual necessary attachments and appliances.

4. The floor space and the height above the engine-room floor, which will be required by the proposed machinery, must be stated.

5. Each bidder will specify the time which he will require in which to fully complete his contract in case his proposal shall be accepted and a contract awarded.

Each tender or proposal for a pumping engine—or for pumping engines—will be held to include everything necessary to make the engine, or engines, complete in every respect, from the delivery pipe connection with the force main to and including the suction pipe, notwithstanding any ommissions in either the specifications or contract.

In case the engine, or engines, which may be furnished, under these specifications and such other specifications as may be adopted, shall fail to show the guaranteed capacity, or to give the guaranteed duties, or shall exhibit imperfect material or workmanship, then the contractor will be required to remove the same, together with the foundations, at his own cost and expense, and shall leave the premises, in every respect, in as good condition as they are now.

If the contractor shall not remove said engine or engines, and foundations, within three months after he shall have been notified, in writing, by the commissioners, that they refuse to accept the same, the Water Commissioners may, at their option, remove said engine or engines, and foundations, sell them, and, out of the proceeds of such sale, reimburse the city of Buffalo for all expense and damages, or they may proceed against the bondsmen of the contractor.

TESTS OF THE MACHINERY.

The pumping machinery, after it shall have been fully completed and adjusted by the contractor, and after the contractor shall have notified the Water Commissioners of its entire completion and readiness for service, will be subjected, by the latter, to the following tests:

1. A *capacity* test of 24 hours' duration.

2. At the conclusion of the capacity test, and without stopping the machinery, a *duty* test will be begun, which shall continue 48 hours.

3. Subsequently, and within two weeks after the conclusion of the tests above specified, a working test shall be begun; provided the engine goes through the first two tests satisfactorily. The working test shall consist of runs aggregating 1,800 hours, and shall be completed within the limits of three months from the commencement of the test.

During the term of the working test the contractor is to furnish an engineer to assist in conducting the same. The engineer to be paid by the water department at the same rate as paid its engineer. The engineer will be allowed to make such light repairs as are customary among engineers without any record of the same, but all material or outside work, by whomsoever furnished, will be charged to the contractor.

In all of these tests, good merchantable anthracite coal will be used; it will be furnished by the Water Commissioners, but may be selected by the contractor.

In making the second or first *duty* test, the fires shall, at the beginning of the test, be in their normal condition, with one furnace ready for firing, the other furnaces having been previously fired in their proper order, and at proper intervals of from 20 to 30 minutes, respectively. Reasonably uniform intervals shall be observed in the firing throughout the test; and, at its conclusion, the fires shall be in the same condition, as to thickness and degree of exhaustion, as at the beginning, *i. e.*, one furnace shall be ready for firing, and the same intervals of time shall have elapsed, since the last previous firing of each of the other furnaces, as had elapsed since the last previous firing at the beginning of the test, respectively.

The hourly rate of coal consumption, and the rate at which the coal is supplied to the furnaces, shall be kept as nearly uniform as practicable throughout the time occupied by both the capacity and first duty tests. The mean quantity of coal put into the furnaces per minute, during the time occupied in making a duty test, will be regarded as the coal consumption (C) in determining the duty.

The net work of the pumps, or the product of the mean load, in pounds, under which they are worked, by the mean space traversed by their plungers, in feet, per minute, will be regarded and treated as a number of foot-pounds of work due to the mean coal consumption C.

The effective areas of the pump-plungers will be taken as the areas due to their diameters, less one-half the areas due to the diameters of their pump-rods, respectively; unless the pump-rods shall pass through both ends of the pump-chambers: in which case the entire area of the sections of the pump-rods will be deducted from the areas due the diameters of the plungers.

Let the *aggregate* of the effective areas of the plungers of any machine, in square inches, be represented by A.

The mean load, or pressure, in pounds, per square inch (P), upon the effective area of a pump-plunger, in any case, will be determined as follows:

The mean pressure, as indicated by the pressure gauge on the force main or delivery pipe being p. and the difference in level, between the centre of said pressure gauge and the mean level of the surface of the water in the pump-well, in feet, divided by 2.3 being p', the mean load or pressure per square inch, in pounds, will be:

$$P = p + p' + 1.$$

One pound, or 2.3 feet, being added to cover the effects of friction through the suction pipe and pumps, and of temperature. No other allowance, of any kind whatever, or for any purpose whatever, will be made.

During the 24-hour capacity test, and during the 48-hour duty test, the steam and water pressures and the readings of the engine-counter will be noted and recorded every 15 minutes, while the quantity of coal used and the height of the water in the pump-well will be recorded every hour.

During the working duty test the steam and water pressures and the reading of the engine-counter will be noted and recorded every 30 minutes, and the quantity of coal used—and the level of the water in the pump-well—every hour.

In making the working test, the same precautions, as to thickness and conditions of fires, shall be observed as are prescribed for the beginning of the first duty test; and thereafter, all coal consumed, during the three-month test, shall be charged to the engine, excepting such coal as may be used for banking fires. In case the operation of the machinery shall be interrupted for any reason by the water department, the coal lost and the coal required to start the engine again shall not be charged to the engine.

The capacities of the pumps will be estimated by the following formulæ, prepared in conformity with the foregoing, and in which the efficiency of the pumps is taken at 0.97. In other words, three per cent. is allowed for loss of action due to the probable imperfect filling of the pumps.

For single-acting pumps,

$$Q = 72.561 \times A \times N \times S.$$

For double acting pumps,

$$Q = 145.122 \times A \times N \times S.$$

The *duties* will be calculated by the following formulæ:

If the pump be single acting,

$$D = \frac{100 \times A \times P \times N \times S.}{C.}$$

If the pumps be double acting,

$$D = \frac{200 \times A \times P \times N \times S.}{C.}$$

In the foregoing formulæ, as already explained,

A = the sum of the effective areas of all the pump-plungers, of any engine, in square inches.

P = the common net load, or pressure, in pounds per square inch, upon the pump-plungers—to be deduced from the means of the recorded data.

S = the common stroke of the pumps of any engine, in feet.

N = the mean number of revolutions of the engine, or the mean number of double strokes of the pumps per minute.

Q = the pumping capacity of the engine, in U. S. gallons, in twenty-four hours.

D = *duty*, in foot-pounds, per hundred pounds of coal.

The capacity and duty tests of the engine will be made by an expert, who shall be selected by the Water Commissioners, subject to the approval of the contractor; or, in the event of the failure of the Water Commissioners to select an expert who shall be satisfactory to the contractor, the Water

Commissioners shall select one expert, the contractor a second, and the two experts thus selected shall select a third. The expense for compensation of the experts shall be divided equally between the water board and the contractor.

In making the first and second tests, no expert is to be engaged who may be interested in business with the contractor or in the employment of either the contractor or water board.

The working test shall be made by the chief engineer of the water department and the engineer furnished by the contractor. In conducting the working tests the boilers and engine must be run in the general and usual manner of running pumping engines at their daily ordinary duty.

The conclusions of the expert, or of the board of experts and engineers, shall be conclusive and binding upon both parties.

The engine, boiler, chimney and foundations furnished, together with all attachments, appliances and connections, must be strictly first-class, in material, design, workmanship, finish and in operation.

It must be completed, delivered, set up, adjusted and in readiness for use, on or before the expiration of the time named in the proposal or contract, and payment for the same will be made within thirty days after the completion of the specified plant, in accordance with the foregoing specifications, and in accordance with such other and additional general or detailed specifications as may be incorporated in and form a part of the contract to be made, and after the tests and acceptance of the same by the Water Commissioners.

Tenders will be received at the Water Commissioners office up to the eighth day of November next at three o'clock in the afternoon.

JAMES N. SCATCHERD,
LOUIS P. REICHERT, } Water Commissioners.
JAMES RYAN,

BUFFALO, Sept. 27th, 1883.

CEMENT CONCRETE, BY SCHUMANN.

[Wochenschrift des Vereines Deutscher Ingenieure.]

The author refers at some length to Dyckerhoff's experiments with cement concrete containing a certain proportion of lime. According to these, concrete is stronger if made by adding cement mortar to gravel, instead of mixing cement and gravel direct. The strength of concrete was found to be much greater when mixed in the air, and afterward immersed, than when it was moulded under water. The porosity of the samples of concrete was tested by subjecting slabs ¼ thick to a pressure of 16 feet of water, after they had been allowed to harden for seven days in a damp atmosphere. The finer the sand used, the less porous was the mortar, and it was found that the porosity was diminished by prolonged immersion in water. A mortar composed of equal parts of cement and sand remained porous for seven days. When lime was added to the mortar the porosity was greatly diminished—a mixture of one part cement, six of sand, and two of slacked lime in the form of a paste, allowed no water to pass after hardening for seven days.

The cracks which are usually found in concrete work are attributed to the contraction of the cement. Prisms seven inches long made of neat cement were observed during a period of one year; after the lapse of this time it was found that a prism kept in a room had shrunk 0.62 per cent., and one exposed to the atmosphere 0.113 per cent.

It was stated that lubricating oil was liable to disintegrate concrete when used as the foundation for machinery.

THE DIVINING-ROD.

BY ROSSITER W. RAYMOND.

Continued from page 459.

This review of the literature of the subject has brought us to the end of an important period, namely, that in which the physical effects of the rod were exclusively discussed, its earlier uses for general divination having gone out of fashion and recollection. Indeed, any attempt to maintain these would have incurred the censure of the church, which would have settled at once the vexed question of agency by denouncing this unauthorized intrusion upon its spiritual prerogative as diabolic. This is indeed what speedily happened, as we shall see. The lost doctrine of moral power reappeared, not among the learned, but out of the obscure mass of the people. In the Province of Dauphiny, in the south of France, the practice of the divining-rod, introduced perhaps by the Beausoleils, had become, 50 years after their death, an art followed by many experts, who were called *Hommes à Baguette*. They were employed to find springs of water, hidden treasure, mines, etc., and also to detect criminals, and even to settle disputes as to boundaries when the landmarks were gone. Two farmers, for instance, having a dispute as to the boundary between their farms, instead of going to a lawyer or judge, would send for a diviner. He, walking over the disputed ground, would indicate by the dipping of his rod the spot where the old landmark formerly stood, and this decision was accepted without appeal. Considering the expense of litigation in all times, and the peculiar character of the justice which at that time was sold so dear and worth so little, we may fairly say that, whatever be the merits of the divining-rod, the peasants of Dauphiny acted wisely in employing it.

In 1692 a mysterious murder was committed at Lyons. A wine merchant and his wife were found dead, lying in their cellar near the bloody axe with which they had been slain. A neighbor urged the authorities (who seem to have had no clew to the murderers) to employ a rich peasant of Dauphiny, already famous as an expert with the divining-rod. This man, Jacques Aymar by name, was sent for—or, rather, it was not necessary to send for him, since he proved to be already on hand in the city by the time it was decided to engage his services. This fact is significant, as giving the key to what turned out to be an extraordinary piece of clever detective work. A careful analysis of the numerous official and other records of this case shows it to be quite possible that the diviner had obtained important clues before he was publicly set to work. He first demanded to be taken to the scene of the crime that he might get his "impression." This consisted in a sort of shuddering, accompanied with signs of agitation, pain and exhaustion, and manifesting itself besides in the dipping of his rod. This took place at the spot where the bodies had lain, the spot where the axe was found, and also in the shop above, at various points which he declared to have been occupied or touched by the criminals. Having thus obtained a thorough impression, after the fashion of a bloodhound getting a scent, he started, though it was night, and followed with his rod the alleged course of the fugitives, passing without hesitation through many unlikely places, as far as one of the gates of the city. Next morning he resumed the trail and tracked it to the house of a gardener, where he declared that the criminals, either two or three in number, had stopped. The gardener and his wife denied all knowledge of them, and Aymar, consulting his rod, declared that neither had touched the murderer. But the rod dipped violently over two young children of the house, who thereupon confessed that three men had stopped there the day before, and had drunk wine at a table, which, by the way, had also been indicated by the rod. The children said they had kept this a secret because they feared being punished for leaving the door unlocked while their parents were away. After some further delays and preliminary tests, the magistrates determined to let Aymar pursue the murderers. He declared that they had taken a boat down the Rhone, and he followed them with an escort in the same manner, landing from time to time at different points where he said they had stopped. His pursuit was continued for a number of days with various interruptions, the assigned causes of which seem to have been sometimes but pretexts, and permit the suspicion that the intervals were employed by him in getting information in other ways. However this may be, he finally brought up at the prison of Beaucoire, and after applying his rod in succession to the inmates, pointed out as one of the Lyons murderers a hunchback, recently arrested for larceny. This man being taken back to Lyons was recognized at several points on the road as having passed just after the murder, and, finally, frightened by the accumulated evidence against him, made a full confession, and was subsequently broken alive. The other two murderers Aymar professed to follow to the sea, and at sea along the coast, and until, as he alleged, they escaped from the kingdom.

So long as there was no doubt of Aymar's sincerity, this discovery of the criminal by the aid of the divining-rod seemed indeed marvelous. But it is not more wonderful than many detective operations in which the rod has played no part, and it is easy to trace the possible or probable methods which he employed. If, for instance, during the period just preceding his engagement by the magistrates, he had, in coming to town from his residence, 14 leagues distant, or in hanging about the town, where everybody was talking of the crime, picked up in any way the circumstances of the three fugitives entering the house where the children were, it is almost inevitable that he would have obtained also some general description of their appearance, and I need scarcely remark that the subsequent tracking of a hunchback would be no difficult matter. It should be added here that the judges who sentenced the hunchback explicitly declared that they attached no weight to the indications of the rod as direct evidence of his guilt, but condemned him wholly upon his own confession, confirmed by abundant circumstantial evidence.

But this achievement of the rod, attested as it was by the public confession and execution of the criminal, made a great sensation in France, and Aymar was called to Paris, where both the court and savans interested themselves greatly in his mysterious powers. Many marvelous feats are reported of him there; but the shrewd and rigorous experiments of the Prince de Condé exposed the emptiness of his pretentions. It was Aymar's claim that his rod was sensitive to the particular object which he was at the time seeking. When he sought a given murderer the track of some other murderer would not divert it. When he was pursuing a criminal he could not be led astray by subterranean water or treasure. If he felt these things in passing, his feeling was nevertheless distinguishable from that connected with his intention, etc. He could, at will, seek any given object, and when doing so could not be deceived. Unfortunately for this claim, the tests of the Prince deceived him very often. For instance, a purse of money was shown him, and after he had got his "impression" of it, it was taken out to be buried in the garden, but instead of burying it, the person who had it kept it in his pocket. Aymar proceeded to the garden, and, undisturbed by the immediate neighborhood of the money in the pocket of a bystander, located a spot where he said it was buried. In another case he detected the gold of the gilding of a chair which was covered so as to permit a glimpse of its ornaments, but he sat on a similar chair, and walked through a saloon containing many of them, all completely covered, without discovering any gold. In another case a window was designedly broken in a palace. Aymar was sent for to trace the thief, who, he was informed, had recently stolen some money from the palace. His rod promptly indicated the broken window as the road by which the thief had entered, and he proceeded to trace also the route of flight, although no such theft had ever occurred. But so long as these and similar failures were not made generally public, Aymar continued to enjoy much celebrity, and no doubt it was enough to turn the head of a peasant to be the object of such attention. Growing more audacious, he undertook to reveal character, and on one occasion, having received a fee from a gentleman of the court, with the request that he would discover whether the gentleman's sweetheart was true to him, he sent for the lady's servant and demanded of him another fee as a condition of certifying her virtue. Scandals of this kind became so bad that the Prince de Condé publicly exposed Aymar, and he returned to his home. On the way, however, in passing through a village, he took occasion to designate five or six of the most respectable houses as the abodes of wicked women, which made a great uproar. I wish I could say that nothing more was afterward heard of him; but, unfortunately, it appears that as late as 1703 this man was employed during the civil war to point out with his divining-rod Protestants for massacre, under the plea of punishment for crimes they had committed.

We find connected with the exploits of Jacques Aymar a new theoretical explanation of the divining-rod. Many persons of more or less scientific training, not doubting the honesty of the man and the genuineness of the sensations which he manifested, cross-questioned him on the subject, and thus accumulated a mass of supposed data for the formulation of the natural law underlying these phenomena. It was at this time that the Cartesian philosophy was dominant in France, and the "subtle matter," "corpuscles," "animal spirits" and "vortices" of Descartes furnished convenient hypotheses to explain almost anything. The two doctors of Lyons first supplied such hypotheses to the case of Aymar, but the subject was treated at still greater length by the Abbé de Vallemont, in his treatise on the divining-rod entitled "Physique Occulte," and published in 1693. In this work he declares that by insensible transpiration particles escape continually from our bodies; that such particles pursue a vertical direction, and strike the divining-rod, which is thus caused to move up and down, assuming a line parallel to the path of the corpuscles. The holder of the rod receives corpuscular effluvia from other human bodies and various substances, and communicates them through his pores to the rod, thus producing also a movement of revolution. The difference of the skin in different people results in various degrees of susceptibility to particular impressions, but Aymar was, according to the abbé, possessed of an epidermis which could receive all kinds of impressions without confounding them. The abbé says that there is a difference of form among the corpuscular effluvia of springs, minerals, bodies of thieves, those of assassins, those of naughty women, those of landmarks, etc., in others words, he recognizes the existence of aqueous matter, larcenous matter, murderous matter, etc., and the last-named variety was the only one which produced upon Aymar very painful impressions. This was due, according to his scientific expounder, to the vehemence of remorse which pervades the corpuscles of an assassin. The fact asserted by Aymar that he had detected and followed the trail of a murderer 25 years after the murder, and the fact that in almost every instance he

necessarily began his researches a day or two after the crime—to say nothing of the cases in which he determined the locality of the landmarks which had been missing for an immemorial period—forced the abbé to a wild hypothesis of the extraordinary levity of the corpuscles, by virtue of which they remained a long time suspended in the air in spite of rain, wind, and even other corpuscles of later origin.

Father Lebrun, in a pamphlet on "The Illusions of Philosophers Concerning the Divining-Rod," printed in Paris in 1693, seriously refuted the system of Vallemont. This pamphlet was republished in the third volume of Lebrun's "Critical History of Superstitious Practices" (Paris, 1702).

But Father Lebrun and a large proportion of those who took part in the discussion rejected the scientific theory altogether, and attributed the facts to Satan. It was asserted that not only might wicked people obtain the divining power by a league with the devil, but that such an alliance might be made unconsciously, and that the power might be conferred upon an unwilling subject, as a means of ruin to his soul. Several cases are described at length in which persons in whose hands the divining-rod pointed out springs, etc., had been by prayer and fasting and the help of their spiritual advisers delivered from this dangerous gift. The authorities of the church favored this view, at least so far as any moral uses of the divining-rod were concerned. In 1701 the Inquisition of Rome condemned the divining-rod and all writtings in support of it.

I condense from M. Chevreul's book the following list of the principal authors on the subject for the period now under consideration:

Dr. Chauvin, of Lyons (a letter to the Marquise de Senozan, dated September 22, 1692, published in the brochure, "Superstitions Anciennes et Modernes," Amsterdam, 1733; also in an appendix to the second edition of Lebrun's "Histoire Critique des Pratiques Superstitieuses").

Dr. Pierre Garnier, of Lyons (a letter to M. de Sève, published November 10, 1692, at Lyons). This, like the letter of Dr. Chauvin, advanced the corpuscular hypothesis.

Two anonymous letters concerning the divining-rod, published in *Le Mercure* of January and February, 1693. The first combats the corpuscular hypothesis; the second argues that, although this explanation is to be rejected, there is, nevertheless, nothing supernatural, magical or diabolic about the phenomena, and that they are probably to be referred to physical causes as yet unknown.

M. de Couriers, a blind man and thorough partisan of the divining rod (a letter in *Le Mercure* of March, 1694).

M. L. de Vallemont, priest and doctor of theology ("Physique Occulte, ou Traité de la Baguette Divinatoire et de son Utilité pour la Découverte des Sources d'Eau, des Minières, ces Tresors Cachés, des Voleurs et des Meurtriers Fugitifs," Paris, 1693, 12mo., 608 pp.). The argument of this book has been summarized above. Its purpose was to diminish the category of "occult" things by showing that the phenomena of the rod, like those of magnetism and electricity, were explicable by the physical corpuscular hypothesis.

Two letters published in the *Mercure* for April, 1693, by order of the Prince de Condé. One is anonymous; the other is addressed by M. Robert, *procurer du roi*, to Father de Chevigny. These are the documents which record the failures of Aymar, and the second concludes as follows: "His Serene Highness desires the assurance to be given to undeceive the public, that the rod of J. Aymar is nothing but an illusion and a chimerical invention. These are the Prince's words."

Father Lebrun ("qui Dècouvrent l'Illusion des Philosophes sur a Baguetta, et qui Détruisent leurs Systèmes," Paris, 1693; also Historie Critique des Pratiques Superstitieuses qui ont Seduit les Peuples et Embarrassé les Savants," Rouen and Paris in 1702). These publications have been alluded to above. The letters comprise an interesting correspondence among Father Lebrun and three of the formost savans of France, Father Malebranche, the Abbé de Rancè (the celebrated Abbé de la Trappe,) and the Abbé Pirot, chancellor of the University of Paris. Lebrum (writing before the Lyons murderers) narratives the alleged powers and performances of the diviners of Dauphiny, and asks Malebranche what he thinks of the matter. The latter, reasoning acutely on the data offered, describes that, as the physical objects (*e. g.*, springs), if the action of the rod is real, water on the surface must agitate it more powerfully than water underground; also that it cannot be possible by any natural law to distinguish between the action of a small spring near the surface and a larger spring lying deeper. As to moral effects (discovery of murderers, missing landmarks, etc.,) he concludes that if the rod really does this without fraud, it can only be from a supernatural cause (presumably demoniac), and that the use of the rod is therefore to be condemned. Lebrun rejoins, agreeing with this view as to the moral effects, but suggesting the corpuscular hypothesis as to material objects. A second letter of Malebranche declines to yield this point, and positively ascribes the whole thing to the devil. Meanwhile, the Abbé de la Trappe consulted by Malebranche, and (like the latter) assuming for the sake of the argument, but not accepting fully the reality of the phenomena, says the discovery of murderers, etc., must be ascribed to Satan, but the physical effects may be the result of a physical cause. Nevertheless, the use of the divining-rod should be discouraged altogether on religious grounds. Chancellor Pirot takes the same position, saying that curès should forbid this practice as unlawful.

In his "Histoire Critique," Father Lebrun gives a large number of instances in which the divining-rod has failed. He cites the Provost of the Isle of France, who testified that he had often employed experts with the rod, both to detect criminals and to discover springs, and had never found one in whose hands the instrument was not "often variable and very often false." He shows the fundamental contradiction between two schools of practitioners, one of which declared that touching the rod with the same substance as the hidden substance which was causing it to move would stop the motion, while the other declared that this proceeding augmented the motion. The conclusion of the argument is that the phenomena of the rod (which Father Lebrun appears to believe are sometimes free from conscious imposture) are due to an intelligent cause of some kind, and that this cause must be Satanic.

Father Ménestrier ("Indications de la Baguette pour Découvrir les Sources d'Eau, les Métaux Cachés, les Vols, les Bornes Déplacées, les Assassinats," etc., published at the end of the author's "Philosophie des Images Enigmatiques," Lyons, 1694). This author takes the same view as the preceding.

M. Baritel ("La Verge de Jacob, ou L'art de Trouver des Trésors," 1693). The translation of this book by Thomas Welton has been already mentioned. The author appears to hold the corpuscular theory of the Abbé Vallemont, with the addition (which I do not find in any of the views of Vallemont's book), that he ascribes the capacity of different men in the use of the rod to the effect of the planets under which they were born, and defines this effect to consist in opening the pores of some more than others, and filling some more than others with "active particles," which, being crowded out through the aforesaid open pores by the intrusion of exterior particles (from springs, metals, murderers, stolen goods, boundary lines, etc.), powerfully affect the rod. Whoever has from his favorable stars both particles and pores galore, can discover with the rod anything he reasonably seeks. But he who has "only plentitude of particles with closed pores," will be sensitive to certain things only, to wit, such as move him most strongly, because the particles emanating from them violently eject his interior particles in spite of his less abundantly perforated epidermis.

The condemnation expressed by so many ecclesiastical authorities and by the Inquisition (October 26, 1701) undoubtedly checked the use of the divining-rod for moral purposes. At least we hear little of such applications in the eighteenth century. But believers in the rod were still numerous, and practitioners abounded, particularly in Dauphiny. The discoveries of Galvani put into the hands of the crude science of the day the materials for a new hypothesis, which was applied to the so-called hydroscopes or water diviners. One of the most celebrated of these, Bartholemy Bleton, was born in Dauphiny in 1750, and in 1780 was called to Lorraine by Dr. Thouvenel, who wished to study a good specimen of this art. The Doctor, like his predecessors a hundred years before, tried credulous experiments and asked questions in abundance, and obtained a mass of supposed facts, out of which he immediately made a book, published in 1781, and called "Mémoire Physique et Medicinal, Montrant des Raports Evidents entre les Phénomènes de la Baguette Divinatoire du Magnetisme et de l'Ectricité." It would be useless to give the voluminous details of his investigation. The following points are, however, especially noteworthy: In the first place, Bleton apparently did not profess to discover immaterial qualities of facts, but chiefly confined himself to the detection of running water. In the second place, he frankly avowed that the rod possessed no power in itself by virtue of its form or material, and that it was merely an index, outwardly exhibiting to the spectators his inward feeling. This feeling the Doctor declared to be a tremor, attacking first the diaphragm and communicating itself through the body and hands to the rod. In the third place this tremor was found by Dr. Thouvenel to be weakened, though not destroyed, when Bleton was on a tree or ladder or another person's shoulder, instead of the ground, or when he touched electrified substances; but the tremor and also the movement of the rod were completely stopped when Bleton was insulated from the ground. Upon facts of this kind he based his electrical theory. I remark, by the way, that the observations and the theory of Mr. Latimer, in his recent work on the divining-rod, already mentioned, recall in a striking manner the performances of Bleton and the theory of Thouvenel. Mr. Latimer claims to have made the new discovery that the effect of the divining rod is destroyed by insulating the practitioner, as, for instance, by placing him upon a platform supported by glass bottles. If he had known how thoroughly this claim had been examined and refuted almost exactly 100 years ago, he would have had less faith in its novelty and value.

Thouvenel's book made no little sensation, and in 1782 Bleton was called to Paris, where a remarkable series of experimental tests were applied to him. A newspaper report of the day declares that in the presence of many thousand of spectators he followed a subterranean aqueduct in the garden of the Luxenbourg for 15,000 yards without a mistake. The chief engineer of the water-works is reported to have said that the trace was so accurate that, if the maps of his office had been lost, Bleton's footsteps would have constituted a complete survey to replace them. It is just possible that the *Journal de Paris* was tempted to make a sensation of the case, and it is also quite possible that a keen observer might notice indications, other than those of his own diaphragm, by which he would follow the line of buried pipes. A large number of experiments, more calmly reported, certainly do not sustain the enthusiasm of this account. It was found, for instance, that Belton often passed over running water, when blindfold, without noticing it; and that when taken several times over the same course he would not point out accurately each time the spots he had previously marked. For example, of 16 points once indicated, he recognized with the rod on the second round but eight and missed the other eight. A single point to which he was repeatedly brought blindfold, he indicated three times and missed three times. Of seven channels of running water which he was made to cross repeatedly, he indicated one once in four times, another once in four times, and another once in three times, while still another, which he crossed in two spots, affected his diaphragm at one crossing, and not at all at the other. The insulation experiment was repeated by a physician at Paris. At a point where Bleton's rod was powerfully affected by alleged subterranean water, he was mounted upon a stool with glass legs, and immediately the rod ceased to be affected. When the stool was removed, however, and he stood upon the ground, the rod resumed its sensitiveness. But Dr. Charles, who conducted this experiment, took occasion, while Bleton stood upon the stool, to bring the top, without his knowledge, into electrical communication with the earth by means of a good conductor, thus destroying the insulation completely, though the hydroscopist supposed it still to exist. Under these circumstances the rod remained inactive, and the destruction of insulation did not produce the slightest result. This was declared at the time to be a proof of Bleton's charlatanry; but, as we shall see hereafter, it is equally consistent with the hypothesis of unconscious mental and muscular action.

As a final test of Bleton's capacity as a hydroscopist, he was taken blindfold into the new church of Saint Genevieve, where there was known to be no water for 100 feet below the floor, the vaults, foundations, &c., actually extended all that distance below. Here he professed to discover at numerous points large and small streams of water. Thouvenal subsequently asserted that his *protegé* had been effected by currents of damp air circulating in the cellar, but this explanation was universally considered as a desperate attempt to maintain a theory already brought into discredit by experimental tests. Bleton, however, though he ceased to be seriously respected by impartial scientists, continued to receive much attention and to do a thriving business, both in Paris and, subsequently, in the Provinces. Here, however, he no longer worked blindfold or professed to see with his diaphragm. He proceeded, like the ordinary water-diviners, with open eyes, studying all the natural indications, and coming to his decisions with abundant leisure, and under these circumstances it is beyond doubt that he rendered many valuable services to landed proprietors, by successfully locating wells. In many cases, however, he failed entirely, and it is reported that even in those in which he succeeded, he was seldom right as to the depth at which water would be found or the quantity which would be obtained. It should be mentioned that in Dauphiny, where Bleton discovered a large number of springs, he was regarded with an esteem never given to Aymar and some other famous hydroscopists. In other words, the people who knew most about the art of discovering water pronounced Bleton to be a real expert, while they believed Aymar and Parangue (of whom a word presently) to be more or less charlatans. A review of all the facts leaves little doubt that in Bleton's case there was an unusually large proportion of the skill of the prospector,

combined with rather less than usual of the mysterious claims of the wizard.

Concerning Jean Jacques Parangue, mentioned above, it will be sufficient to say that he was born in 1760, near Marseilles, was said to have been peculiarly sensitive as a child to the presence of subteraneans waters, and became famous as a hydroscopist; but he used no rod at all and the scientific theory advanced by his friends was one of clairvoyance. His eyes were describes as very peculiar, and it was asserted that he saw water through rocks, earth or masonry, but, strangely enough, not through wood, crystal or glass. Like Bleton, he often deceived himself as to the volume and depths of the springs he discovered.

Dr. Thouvenel never saw Parangue, but defended him against the incredulity of the physicists and undertook to show that the phenomena of clairvoyance even was merely a case under his electrical theory. According to his explanation the delicate nerves of the eyes were affected by the electrical currents traversing the body, and therefore the clairvoyant really experienced the sensation of vision by an internal, not an external, excitation. Those who have read the admirable treatise of the late Dr. Clarke upon pseudopia will notice with interest that in this case Dr. Thouvenel, explaining imaginary facts by an untenable hypothesis, nevertheless came very near a true physical theory of visions.

The worthy doctor emigrated at the time of the French Revolution, and carried with him to Italy another Dauphinese hydroscope named Pennet, whom he exhibited from city to city in support of his electrical theory. Pennet professed to find with his rod not only water, but buried metals and coal. I will not go at any length into the experiments. Some of them were striking and successful, and impressed even such savans as Spallanzani, more or less predisposed to expect discoveries in the new domain of animal magnetism. In many other cases, hower, the experiments failed. For instance, in a trial of three days, at Padua, before a commission of savans, Pennet promenaded for two hours on the first day in the garden in which had been buried, at different points, four metallic masses and 1,000 pounds of coal. He could not find the metals at all, and only after much difficulty indicated the coal. On the second day his ill success was equally marked. Finally, on the third day, of three metallic deposits he failed to find the first, came pretty near the second without exactly hitting it, and found the third. The area covered by the search was only 840 square feet. Upon this test Spallanzani revoked his favorable opinion. But at Florence, as reported by M. Bilot (Mélanges Scientifiques et Litteraires," 1857, t. ii., p. 80), though I do not know on what authority, Pennet was so completely disgraced as to render worthless all evidence furnished by his career. A walled inclosure was prepared for experiment. It contained 90 small divisions, in five of which metals had been hidden. Dr. Thouvenel, having discovered that wet weather hindered success, the experiment was delayed until after eight dry, fine days, and it was then fixed for the following day. During the night which intervened, Pennet climbed by means of a ladder into the inclosure. A suspicious person who was watching the ground removed the adder, and whatever the divining-rod could show, t was unable to show the prisoner the way out. This adventure, being made public, destroyed the credit of Pennet at Florence. Dr. Thouvenel could not deny the fatal fact, but, with true loyalty of science, declared that Pennet's moral defects had nothing to do with his physical faculty. It is only fair to add that no such passage as this is cited from Dr. Thouvenel's works.

[TO BE CONTINUED.]

JASON GOULD, MAP-MAKER.

MARLBOROUGH, N. Y., Sept. 29.—In the smoking car of a north-bound West Shore Railroad train this morning the conversation was chiefly about railways and stocks, and the name of Mr. Jay Gould was frequently mentioned. One of the party after a while inquired: "Mr. Tillson, are you the man that Mr. Jay Gould said before the Senate Labor Committee had cheated him out of his pay and board money while he was surveying a map of Ulster county?" The gentleman so addressed is the President of the Fruit Growers' Association, the membership of which is composed of leading peach, grape, and berry growers in the principal fruit-growing towns in Ulster county, and along the west bank of the Hudson River generally, between Cornwall-on-the-Hudson and Rondout. In reply to the rather pointed question, Mr. Oliver J. Tillson said: "I don't know how many copies of marked papers I have received since Gould gave his testimony, but it is evident that a good many people think Gould was hitting at me. Gould and I made the most of the Ulster county map, but I am not the man that told him to 'hang up' his board bills at taverns."

"Were not you and Gould partners in the map business?" was then asked. Mr. Tillson said such was the case, and, being urged to "tell the story," did so as follows: "When I first knew Jason Gould—now known as Jay Gould—he had not attained his majority. It was in the year 1852. I was then about 20 years of age, and I was living with my father, T. F. Tillson, on his farm in the southern portion of the town of Rosendale, Ulster County. I met Jason Gould for the first time on a fine summer morning, on the tow-path of the Hudson and Delaware Canal, between Rosendale village—where O'Donovan Rossa, the dynamite apostle, lectured and collected $700 one night this week—and my father's house. I was walking along leisurely when Jason introduced himself, and, after learning my name, he told me I was just the young fellow he had tramped a good many miles along the tow-path that Sunday morning to see. There were tears, real tears, in his eyes as he told me the story of his life. He was then only 19, and, as far as I can recollect, what he said tallied pretty well with the story he related to Senator Blair's committee about his failure in the map business. He said he had heard that I had some knowledge of surveying and civil engineering, and he had come to see whether he and I could form a partnership. He told me, as the tears started out of his eyes, that he was in debt and entirely without ready money. His story of the map venture, as I remember, was this: In 1851 John J. Snyder, of the town of Rochester, conceived the idea that a tolerably good-sized map of Ulster County would sell readily. At that time only one map had been published, and it was a small unreliable affair. Snyder didn't have any more money than he knew what to do with, and Gould being what Snyder called "a likely young fellow," Snyder hired Jason to make a survey. Gould had then been working for Snyder for several months, and the story of his experience in trying to obtain board on Snyder's credit, and the rebuffs he met with, was told me nearly in the same way (though he cried when he was talking to me) as he told it to the Senate Labor Committee. When John J. Snyder hired Gould he also engaged Peter H. Brink, then a Saugerties young man, to help with the work. Gould was assigned the 'back towns'—Wawarsing, Olive, and Rochester—and Brink partly 'did' the river towns, including Esopus and Lloyd. By the time Gould had told me all that as we walked slowly along the tow-path, we had got to my father's house, and I asked him to come in. Finally I made up my mind that I would go into partnership with Gould and Brink, which business arrangement was consummated four days after I met Gould on the tow-path. Not one of us had much money, but finally we 'raised the wind'—at least my father did—to buy two odometers, one for Brink and one for myself. Gould had his own odometer. More correctly speaking, he had John J. Snyder's, for Gould, after he concluded Snyder was 'no good,' kept the odometer and all the surveys and books besides. Gould and Brink and myself went to work with a vim. We took different routes, and I at least, had 'great expectations' when I started out with the odometer, trundling it wheelbarrow fashion over the rough country roads. We agreed that we would meet every Saturday at my father's house, in Rosendale, where, on that day and on Sundays, we 'fixed things up,' as Jason used to call it, and compared notes. Gould boarded at my father's. We got all through Dec. 27, 1852. The map of Ulster County was then completed, except the engraving, and Gould said he would like to sell out and go back up to his home in Delaware County. We held a sort of an auction among ourselves and I brought in all the books and papers and original surveys, and Brink and I together bought out Gould's right and title in the map. All the papers and the original map I now have in my house at Highland. I forgot to state before this that when Gould, Brink, and I formed copartnership John J. Snyder sued us in the Supreme Court. We gave our case to T. R. Westbrook, who is now Judge Westbrook. The case was dismissed, with costs to the plaintiff."

Mr. Tillson here left the train, but, at the request of the writer, he kindly continued the story at his residence. He then hunted up the books, map, and original surveys, and the receipt Mr. Gould gave when Mr. Tillson and Mr. Brink bought him out. The following is a verbatim copy of the receipt:

DECEMBER 27th, 1852.

Recvd of Oliver J. Tillson & Peter H. Brink Ninety Dollars & Wheel in full of all debts and demands and dues against them and the Ulster County Map.

JASON GOULD
FOR
JOHN B. GOULD.

Mr. Tillson next showed eight little pass-books which Mr. Gould purchased of George H. Bell, No. 158 Nassau street, New York, as the little tags pasted in the covers indicate, for making notes of the survey. Four of these books were written first in pencil, in a very fine hand, and subsequently with ink over the pencil-marks by Mr. Gould. The other pass-books "were written up" by Messrs. Tillson and Brink. "You will observe," said Mr. Gould's former partner in the map business, "that there isn't any foolishness in Jason's books. He was all business in those days, as he is now. Why, even at meal times he was always talking map. He was a worker, and my father use to say: 'Look at Gould, isn't he a driver? I tell you, he's a driver.' And what a mania Gould developed while boarding at my father's for writing his new name, Jay, instead of Jason. He scribbled it on everything. Look at this book, marked No. 1. See there and there and there," and as Mr. Tillson spoke he handed one of Mr. Gould's old survey-books to the writer, and pointed out the many signatures on the inside of the cover, all written a neat but somewhat effeminate and a trifle shaky style. In only one place in the four survey-books written by Mr. Gould, the receipt above alluded to excepted, did Mr. Gould write his name Jason as he was christened in his old home in Delaware County.

"How did it happen that Mr. Jay Gould in signing his name Jason Gould, added 'for John B. Gould?'" I asked. Mr. Tillson replied: "John B. Gould was Jason's father, and he advanced his son a trifle at one time while we were surveying. Besides, at the time Jason gave me the receipt he was a minor, and said that that was the correct way of signing. The 'wheel' which Gould mentions in the receipt was the odometer he got of Snyder and kept, and which he trundled all over the then wild western portion of the country. Did the maps pay me? Well, after I became the sole owner I think it did a trifle, but the truth of the matter is all three of us knew a good deal more about map-making after we got through than we did when we commenced. Where is Brink now? He is living in Elizabeth, N. J., or was very recently. After I bought Gould out I lost track of him, and, in fact, he passed out of my recollection until he turned up in the Erie Railroad stock muddle."—*N. Y. Times.*

THE NIAGARA RIVER BRIDGE.

We are indebted to C. C. Schneider, C. E., Chief Engineer of the "Niagara River Bridge Company," and the designer of the structure now being erected, for the plan from which the present illustration was made, and for the data from which the present description is compiled.

The bridge will be a double track railroad bridge and is designed to connect the New York Central and the Michigan Central Railways. It is located about 300 feet above the present railroad suspension bridge, where the width of the opening to be spanned, from bluff to bluff, is 860 ft. As false works would be impossible in the deep and rapid current of the Niagara River at this point, Mr. Schneider has designed a bridge of the cantilever type, which is self-supporting during erection.

The general dimensions of the bridge are as follows:—Length of bridge proper, from center to center of end pins, 910 ft. 4½ in.; divided into two cantilevers of 395 ft. 2 $\frac{5}{16}$ in. each, and one intermediate span of 120 ft.

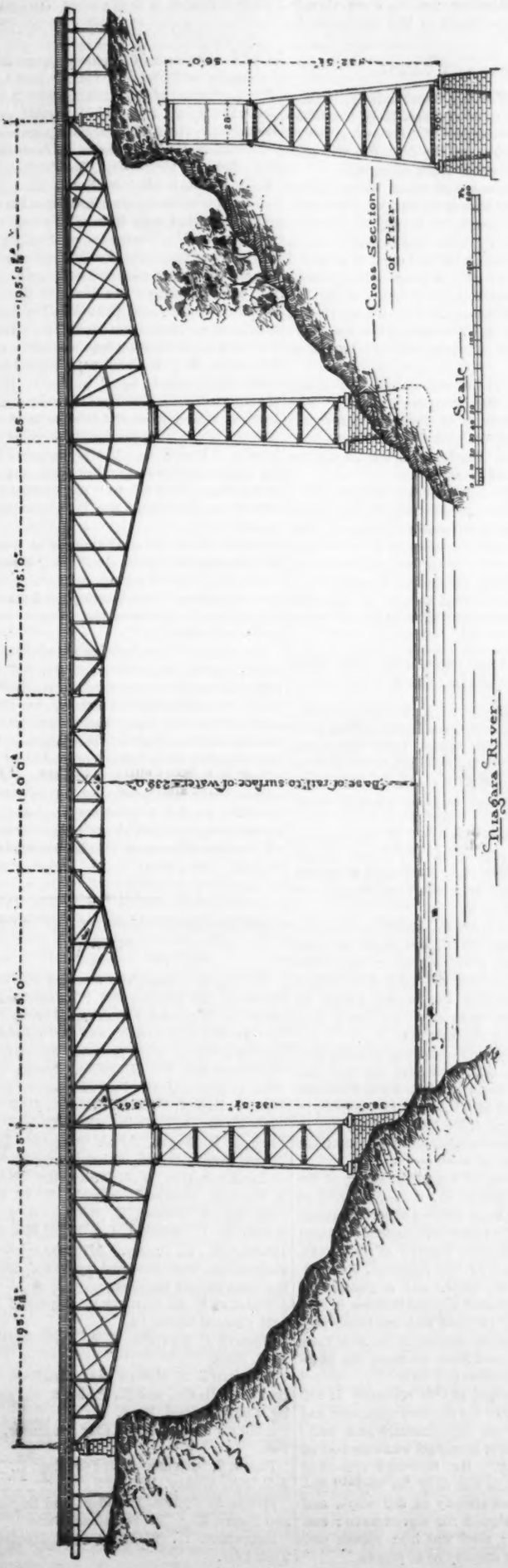
The towers are braced wrought-iron structures, 132 ft. 6½ in. high, resting upon masonry piers 39 ft. high; the foundations under the towers are of beton, 8 ft. thick, directly on the rock.

The trusses are two in number, 28 ft. apart between centers; the panels are 25 ft. long, excepting those of the intermediate span, which are 24 ft., and the end panels of the shore arms of the cantilevers, which are 20 ft. 2$\frac{5}{16}$ in. long. The depth of the cantilever trusses, over the towers, is 56 ft.; and at the ends, 21 ft. for shore-ends, and 26 ft. at the river-ends.

The structure has been proportioned to carry, in addition to its own weight, a freight train on each track at the same time, weighing one ton per lineal foot, with each train headed by two 76-ton consolidation engines. The factor of safety is 5. Wind bracing has been proportioned for a pressure of 30 pounds per square foot, on a surface twice the area of one face of the truss, plus area of floor system, plus the area of face of train taken at 10 ft. vertical height.

The material used in the superstructure is open-hearth steel and wrought iron. Towers and heavy compression members, such as lower chords and center posts, are of steel, as are all the pins. All tension members are wrought-iron. The only use made of cast-iron is in the pedestals on the masonry and in filling-rings; the castings at the top of the towers are all steel.

The whole of the superstructure is pin connected. The towers contain four columns each,



THE NIAGARA RIVER BRIDGE.

and each column is made up of plates and angles in sections of about 25 ft. in length, braced with horizontal struts, and with tie-rods. The batter of columns at right angles and the center line of the bridge is 1 in 8. In the cantilever trusses the lower chords and center posts are made of plates and angles latticed, the intermediate posts are made of 12 in. and 15 in. channels, latticed. The upper chords of the cantilevers are 8 in. eye-bars, the shore arm having a compression member 18 in. deep, composed of plates and angles packed between the chord-bars. The shore ends of the cantilevers are attached to short links, revolving on pins anchored to the masonry; these links serve as rockers and allow for the expansion and contraction of the shore ends of the cantilevers. Expansion joints are also provided for at the connection of the intermediate span with the river ends of the two cantilevers; the intermediate span being suspended from the extreme ends of the river arms.

The floor-beams are 4 ft. deep, and are made of plates and angles; they are riveted to the posts. There are four lines of longitudinal stringers, resting on top of the floor beams; these stringers are plate girders 2 ft. 6 in. deep. The ties are white oak 9 in. by 9 in. spaced 18 in. between centres; every other tie projects to support a plank walk and hand-railing, which latter is made of cast iron posts 6 ft. apart, and four longitudinal lines of 1¼ in. gas piping. The guard timbers are of white oak 8 by 8 in.

All masonry is built of Queenstown limestone, in courses of 2 ft. rise. The piers for the towers are 12 ft. square under the coping, and have a batter of ½ in. to the foot; each pair of piers is connected by a wall 3 ft. 9 in. thick at the top, and battering the same as the piers.

The anchorage-piers are 11 ft. by 37 ft. 6 in. under coping, with a batter of ½ in. to the foot. They rest on a platform consisting of twelve iron plate-girders, 2 ft. 6 in. deep and 36 ft. long; under these plate-girders are eighteen 15 in. I beams, through which the anchorage-bars pass, in such manner as to distribute the pressure over the entire mass of masonry. Each anchorage pier contains 460 cubic yards of masonry, weighing 2,000,000 pounds; as the maximum uplifting force from the cantilevers, under the most unfavorable position of load, is only 678,000 pounds, it will be seen that this upward force is amply counterbalanced.

In erecting this bridge the following will be the method of procedure. The shore-arms of the cantilevers will be erected on false works in the usual manner; after the shore arms are in position and anchored down to the anchorage piers, the river arms will be built out panel by panel, by means of a "traveler," which advances as each panel is in place and its bracing adjusted. As before mentioned, this method of erection is rendered possible by the type of the bridge adopted; the intermediate span of 120 ft. is so designed, with bottom compression members, that it, too can be built out from the river-arm of the completed cantilever until the middle panel is reached, which will then be accurately fitted to close the remaining gap between the two sides. The fixed connections between the intermediate span and the cantilevers will finally be removed to allow the expansion joints to act.

The contract for the entire structure was awarded to the Central Bridge Works of Buffalo, N. Y., on April 11, 1883; and at the present time both towers are erected and a portion of the shore arms of the cantilevers are in place. It is expected that the entire structure will be completed by Dec. 1 next.

The engineering force on this work is made up as follows: C. C. Schneider, Chief Engineer; A. R. Trew, Principal Assistant; J. A. Bell and B. F. Betts, Assistant Engineers. S. V. Ryland is Superintendent of Construction for the Central Bridge Works, and Wm. F. Zimmerman is the Inspector.

We expect shortly, through the courtesy of Mr. Schneider, to give our readers the principal details of this exceedingly interesting and important work.

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NOTICES OF MEETINGS.

AMERICAN INSTITUTE OF MINING ENGINEERS—PROGRAMME OF THE TROY MEETING, OCTOBER, 1883.

LOCAL COMMITTEE OF ARRANGEMENTS:—R. W. HUNT, Chairman; HENRY BURDEN, Secretary.

Tuesday, Oct. 9.—Opening session, in Keenan Hall at 8 o'clock p. m. Reception to members and associates by the Troy Club, at 10 o'clock. p. m. Evening dress not expected.

Wednesday, Oct. 10.—Excursion by carriages at 9 a. m. to the Fuller & Warren Company's Clinton Stove Foundry; then to the Rensselaer Merchant and Rail Mills, of the Albany and Rensselaer Iron and Steel Company, and finally to the works of the Burden Iron Company. Mr. James A. Burden will kindly entertain the visiting members and ladies at his residence, Woodside, at 1:30 p. m.

In the afternoon a visit will be made to the Albany Iron Works and the Bessemer Works Department of the Albany and Rensselaer Iron and Steel Company.

In the evening there will be a session at 7:30, in Keenan Hall, for the reading and discussion of papers.

Thursday, Oct. 11.—At 9 a. m. a visit will be made to some of the shirt and collar shops and laundries of Troy.

Sessions for the reading and discussion of papers will be held in Keenan Hall at 10:30 a. m. and 3 p. m.

In the evening there will be a subscription dinner at the Troy House, at which ladies, as usual, are expected.

Friday, Oct. 12.—A special train will be provided to take the members to the Hudson River ore property, at Burden Station, as guests of the Hudson River Ore Company. After inspection of the mines and roasting kilns, lunch will be provided by the Company, and the party will then return to Hudson, where those going South can take the regular afternoon train, those going North remaining on the special train for Albany and Troy.

Hotel accommodations will be found at the Troy House ($3 per day); American House ($2.50 per day); and the Mansion House ($2 per day). The Troy House will be the headquarters of the Institute during the meeting, but it is not expected that all the members, and ladies accompanying them, can be accommodated there.

No reduced railroad rates have been obtained for the meeting.

It is desired that members should notify the Secretary of the Local Committee of their intention to be present at the meeting, and state whether ladies will accompany them.

Members are advised to secure rooms by writing directly to the hotels.

T. M. DROWN, Secretary, Easton, Pa.
R. W. HUNT, President, Troy, N. Y.

THE CABLE ROAD ON THE EAST RIVER BRIDGE.

The daily press is much exercised over the welfare of the cable road on the East River Bridge, and each one of the many reporters in this city has his individual opinion as to the merits and demerits of the present management and equipment.

The homely proverb of "each man sticking to his last" will apply very well to these critics, for what the average reporter *don't* know about "grips" and cable roadways would make quite a library of engineering literature. We are almost compelled to admire the fearless and self-confident manner in which these gentlemen make light work of problems that have proved stumbling blocks to the experts.

The conditions which control the successful working of the road in question are unique and complex, and a certain amount of experimental work is absolutely necessary in this as in any other new departure before ultimate perfection can be reached. The trouble lies in the fact that Chief Engineer Martin and Col. Paine must make their experiments under the eye of the public, instead of in the privacy of a workshop or office, and this public, although totally ignorant of the governing conditions and detail, always feels itself called upon for an opinion and general advice.

The men who successfully completed the greatest bridge ever built should be trusted to finally solve the problem they now have in hand. If they fail, who can do it? Every community has its "wise men," and some of these parties have been ventilating themselves through the daily papers; but we make the assertion that no other engineers could accomplish the end in view so well as the very men who now have the matter in charge. And that they will not operate the road until every detail is perfected is very much to the benefit of the unthinking public, even though the latter find little virtue in the advice to be meanwhile patient.

THE PANAMA CANAL.

We select the following items relating to this work from the last number (Sept. 15) of the *Bulletin Canal Inter-Oceanique*. The following list of plant in actual service on the Isthmus will give some idea of the means of work on hand:

20 dredging machines, 8 of which belong to the contractors; 7 steam barges for removing material, 32 barges without steam, 72 barges of different kinds, 33 tow-boats, 72 steam excavators, 52 steam cranes, 94 locomotives, 3,190 dirt cars, of 5½ and 8 cubic yards capacity; 137 $\frac{8}{16}$ miles of railway track, 2,226 cars, and about 32 miles of track of the Decauville system; 28 locomotives for transportation of general material, and 793 cars for the same service; 117 stationary engines, and 185 pumps of diverse patterns.

It is claimed that at the end of last July 11,000 laborers were in the employ of the company. The working force is made up of Indians, blacks and mulattoes. The native laborer comes generally from the coast near Carthagena; the blacks are from the Antilles and Jamaica.

During the month of August last 280,000 cubic yards of material were moved—25 per cent. more work than was done in the preceding month. This amount it is expected to raise to 500,000 cubic yards by December next, at the commencement of the dry season, and then gradually increase, says the *Bulletin*, to the normal output of 2,700,000 cubic yards per month required to finish the work in 1888.

THE AMERICAN SHIP-BUILDING COMPANY OF PHILADELPHIA.

On Saturday, Sept. 30, at 12 o'clock precisely, this company successfully launched their first ship, the *T. F. Oakes*. This vessel, built under the management of Henry H. Gorringe, President of the company, is an iron sailing ship of 1,800 tons register, 3,200 tons cargo carrying capacity on 22 ft. draft.

The new ship is owned by Wm. H. Starbuck of New York, and is to be used in the Pacific freight trade, plying between New York and Portland, Oregon, and is named after the Vice-President of the Northern Pacific R. R.

Her length over all is 284 ft., length on load line 254 ft., beam amidships 42 ft., and depth of hold 23½ ft.; she will carry 26,000 sq. ft. of sail. Her masts are all wrought iron, riveted and internally strengthened throughout the entire length by angle iron; and the main spars are built in a similar manner and of like material.

A sister ship of 3,200 tons carrying capacity now lies on the stocks in this yard with her iron ribs ready for the plating, and two iron schooners—one of 1,100 and the other of 600 tons cargo capacity—and a steam collier of 1,200 tons capacity are in various stages of construction, and show that the company have plenty of work on hand.

Through the courtesy of President Gowen of the Philadelphia & Reading R. R., a special train of five cars conveyed a large number of invited guests from New York to the scene of the launch. Among the visitors were Senator Bayard of Delaware, Robt. Sayre, President of the Southern Pennsylvania R, R., Cyrus W. Field, and a number of other gentlemen interested as stockholders in the company, or in our railroad and maritime progress. Among the representatives of the New York press were the *Army and Navy Journal*, the *Shipping World*, and ENGINEERING NEWS.

The ship-building plant of this company is unexcelled in this country for its arrangements and facility for doing work expeditiously and well; the keel of the ship first launched was only laid on the 2nd of last May. Mr. Gorringe remarked that the present launch was only the beginning—nine other vessels were already on the ways, and contracts had been signed for eleven more; and that the demand for steel and iron vessels was never so great in this country as at present.

WEISBACH'S MECHANICS OF ENGINEERING.

"The Mechanics of Engineering and Machinery," by Dr. Julius Weisbach, vol. iii. part 1, section 1. The Mechanics of the Machinery of Transmission, second edition, thoroughly revised and greatly enlarged by Gustav Herrmann, translated by J. F. Klein, D. E., Professor of Mechanical Engineering, Lehigh University, Bethlehem, Pa. John Wiley & Sons publishers, New York.

This volume is the first installment of the second edition of what was formerly known as Vol. III. of "Weisbach's Mechanics of Engineering." In the hands of the editor, Prof. Gustav Herrmann, of the Royal Polytechnic School of Aachen, Germany, the original matter has been so thoroughly reclassified and revised, the method of discussion so much improved and so much new material added, that this second edition is practically a new work; it is enlarged to such an extent that there will be three volumes, each equal in size to the whole of the first edition. As divided by Prof. Herrmann, Part. I.. which constitutes the present volume, is devoted to the "Mechanics of Machinery of Transmission;" Part II. to "The Mechanics of Machinery for Lifting and Transporting (solid and fluid) Materials," and Part III. to "The Mechanics of Machinery for Changing the Form and Size of Material."

To use the words of the editor, he has arranged his subject under the heads of the "Transmitters," "Operators" for changing the positions of objects, and "Operators" for changing the form of objects, and separately discusses the methods of arrangement and effect.

The name of Weisbach as an author of engineering works is too long and too well known to need any words of commendation; and Prof. Herrmann in amplifying and reclassifying the original material has only made it still more invaluable to the engineering student. The American translator has done his work conscientiously and well; and in text and illustrations the publishers have left nothing to be improved upon. These books are a necessity to the progressive engineer, and the present volume should have a place by the side of all previous editions of Weisbach upon his library shelves. Price $5.00.

THE AMERICAN SOCIETY OF CIVIL ENGINEERS.

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The regular fortnightly meeting was held at the House of the society, No. 127 East Twenty-third street, on Wednesday evening, Director George S. Greene, Jr., in the chair, and the following members and visitors were present: Secretary Bogart, Vice-President W. H. Paine, Joseph P. Davis, Wm. P. Shinn, J. G. Van Horne, S. S. Haight, Chas. E. Emery, D. McN. Stauffer, H. D. Blunden, R. L. Harris, A. B. Paine, Theo. Cooper, Geo. H. Frost, E. B. Noyes, A. G. Compton, E. R. Andrews, Mendes Cohen, of Baltimore; N. W. Ellis, G. Lehlbach, Geo. W. McNulty, Mr. Whistler, A. N. Connett; Charles Macdonald, J. W. Ferguson, Gen. Geo. S. Greene, C. E. Brown, Edward P. North, F. C. Prindle, Col. J. A. Monroe, W. J. Haskins, W. H. Turner. After the minutes of the last meeting were read and approved, the following were elected members:

CHARLES E. H. CAMPBELL, Raymond & Campbell, Council Bluffs, Ia.

GEORGE A. MAN, JR., U. S. Ass't Engineer, St. Paul, Minn.

CHARLES J. A. MORRIS, Ass't Engineer, St. Anthony's Falls Co., and St. P., M. & M. and M. U. Ry. Cos., St. Paul, Minn.

ANDREW ROSEWATER, City Engineer, Omaha, Neb.

FRANK S. STEVENS, Ass't Div. Eng. N. Y., W. S. & B. Ry., Albany, N. Y.

HENRY R. TOWNE, President and Engineer Yale and Towne Mfg. Co.. Stamford, Conn.

FREDERICK W. WATKINS, Civil Engineer, New York City.

The Secretary announced the death of George Doane Ansley, member of the society. Mr. Harris, of Brooklyn, called the attention of the society to the death of S. S. Montague, late Chief Engineer of the Central Pacific R. R., and while regretting the fact that Mr. Montague was not a member of the society, he hoped that the death of a man so eminent in the profession would not be allowed to pass unnoticed. A resolution expressive of the sympathy of the society with the friends of the deceased, and regrets for the early death of so eminent a member of the profession, was passed.

The Secretary then read the paper of the evening: "Experiments on the Strength of Wrought Iron Struts," by James Christie, M. Am. Soc. C. E. The following is an abstract of this valuable paper:

The author described an extensive series of tests upon struts of angle iron, tees, channels, eye beams and welded tubes, recently made by the Pencoyd Iron Co., of Philadelphia. The series contained over four hundred tests, and covered struts with fixed ends, rounded ends, flat ends, and pin, or ball and socket ends. The lengths of the struts were varied from very short lengths up to the extremes of practice by regular gradations. It is the most complete and truly scientific series of tests upon struts ever made, and when accessible in a completed form will be of untold benefit to all interested in wrought iron construction.

The author, by careful manipulation of the position of the end bearings of his struts, shows how important a factor is the correct centering of the line of strain; and states that when the centering is properly made pin-ended struts give as high results as for flat ends; a result difficult to obtain with certainty in practice.

He also shows very conclusively that the size of the pin has a most important bearing upon the resisting power of the pin-ended struts.

The engineering profession owe the liberal-spirited proprietors of the Pencoyd Iron Works a debt of gratitude for having carried out in so careful and painstaking a manner such a desirable series of tests, and for having given the results so promptly for publication. They have not waited for a government appropriation, but have used the means within their own control to solve a very desirable problem.

It is to be hoped the example may become contagious and that other manufacturers will throw off, for a little while, the question of self-interest, and add their mite to the general subject of the strength of constructive materials. We have heard so much discussion of late years about congressional appropriations and the establishing of a "perfect programme of tests," without any practical results, that it is refreshing to find that the spirit of self-help and independence of government support has not entirely died out among American manufacturers and engineers.

The paper was further discussed by C. E. Emery, but its technical character rendered general discussion quite out of the question until after the entire paper should be put in type and distributed among members.

After adjournment, a collation after the uniformly excellent and liberal style which characterized similar "events" last season was served.

THE INDUSTRIAL SITUATION.

The manufacturers of bridge iron and steel and material going into engineering work have been in receipt of orders, during the past thirty days, for large supplies, for delivery during the winter and spring, for enterprises of considerable magnitude in the way of bridges, down to the smallest uses to which iron and steel material is put. From reports just received from the larger bridge building establishments, it is evident that a very flattering degree of activity prevails, and that the capacity is fully employed up to the close of the current year. Railroad companies are exhibiting commendable enterprise in removing old structures and erecting new ones, and making a multitude of minor improvements in accordance with the suggestions of their engineers, having in view the ultimate improvement of railway properties, giving them a higher state of effectiveness than was in the original designs of their builders. The great increase in wealth, and in the volume of traffic; the more systematic management of railway interests; the emulation which exists between the managers of different lines as to the degree of perfection to which they can bring their respective roads, and the natural desire to have the best road, the best appliances, and the best *everything;* these, and a multitude of minor influences, are leading to the policy, on the part of the managers of railway lines, of establishing the best possible facilities, and making their respective roads as valuable as possible. Economy is being studied from a new standpoint, and the best is more generally considered the cheapest. There is a disposition to imitate the compactness and completeness of English roads, and, in many respects, the imitation is commendable. The carelessness which characterized the early construction of roads in the United States has been dropped none too soon, and the character of all of the recent engineering work is such as to command the respect of engineering talent everywhere.

Construction material has reached the lowest prices which are possible with the present elements of cost. Our Bessemer steel rail mills are all working to full capacity, but orders for future delivery are not so abundant as a few months ago. This falling off is due to the unwillingness of railway builders to enter into the construction of long lines at the present time. The requirements for traffic and transportation are about met, at least, for the present, and hence it is that most of the construction heard of is in short lines of from 10 to 100 miles, and to complete existing lines, to connect existing lines with others, and, in a word, to make symmetrical the existing railway system. Steel rails are selling at $37 to $40 per ton, according to location of mill. Makers have inquiries in hand for blocks of from 5,000 to 10,000 tons, at prices ranging from $36 to $36.50. It has not transpired whether these low prices will be accepted or not, but buyers are evidently in no haste to place contracts and show great determination in holding back for 50c. to $1 per ton.

The heavy production of American furnaces has resulted in another drop in pig-iron this week of 50c. to $1 per ton—a drop which will necessitate a restriction of production, and ultimately a corresponding improvement in demand. Large consumers have been purchasing in a hand-to-mouth manner all summer, in view of this decline. Margins of profit are very narrow, and there is no escape from the declining tendency. We are only now beginning to feel the effects of the heavy increase in producing capacity during 1881 and 1882. The only harmful results that need be anticipated are depression in prices and restriction of production, until the demand of the country shall once more overtake producing capacity. How long this will be is a question upon which opinions differ widely. With our enormous railway system, and the enormous influx of foreign population, and with the restlessness of our own home population, with their desire for new fields and new opportunities, it is not probable that the process of overtaking supply will be a tedious one. Twelve months will make a wonderful change in the relation of producing to consuming capacity.

The large supply of capital is the strongest factor in the problem, and this supply will be used for the development of our resources, agricultural, mineral, and manufacturing, and this, more than any other single influence, stimulates the race of the consuming interests after the producing interests. Their equalization is only a matter of time. With an abundant capital, strong credits, solid confidence, and without any weak spots in our commercial or industrial situation, we can with confidence look forward to a rapid development of healthful influences for the readjustment of the great forces which underlie our future prosperity.

HELLER & BRIGHTLY'S NEW CATALOGUE OF ENGINEERS' SURVEYING INSTRUMENTS.

The compilation of a trade catalogue is an art within itself. Some such are a bare statement of figures, useful if you need just that kind of information, but not likely to attract attention in themselves; others are models of arrangement and typography, illustrated with the best examples of the engraver's art, and interleaved with data and general information relating to the article manufactured that raise the book far above the level of a mere "price list." The catalogue received belongs to the last category, and we congratulate the firm and their customers upon the character of this last issue.

Among the latest additions to the illustrations we notice two that are peculiarly useful to the practicing engineer; and these are two skeleton sketches of a transit and a level, both lettered, and accompanied by a list of technical names of each and every part of the instruments mentioned. We say useful, because not one engineer in five knows what to call the many parts of the instrument he daily fingers, and to our knowledge the mistakes are many, and sometimes, as in ordering a level or transit, productive of annoyance and disappointment to the maker and user as well.

In the "side notes" in this little book are practical hints on the good points and defects of an ordinary transit, methods of testing all classes of surveying instruments, useful remarks on the surveyors' and solar compass, errors of alignment, etc., etc. This information, coming as it does from a well-known maker and an expert, must be invaluable to the novice and useful often to the one who thinks "he knows it all," perhaps especially useful to the latter.

The success and good name of Messrs. Heller & Brightly are due in a great measure to their attention to detail and to the *wants* of the civil engineer and surveyor, and to the progressive spirit that has long ago led them to cast aside old and exploded methods, and to constantly improve—in a word, to advance with the times. This feature is evinced in the "points" they give the profession in their pamphlet, which will well repay study, even where the old transit is "good enough."

PERSONAL.

SECOND-LIEUT. R. G. HILL, 20th Inf., proceeds to Fort Reno, I. T., to make detailed topographical surveys.

CHIEF ENGINEER BROWN, of the Pennsylvania Railroad Company, will arrive home from Europe this week.

JAMES HUNCILMAN, of Louisville, Ky., is now a resident engineer of a division on the Memphis & New Orleans R. R.

SECOND-LIEUT. W. A. GLASSFORD, of the Signal Office, will be instructor of signaling at Fort Leavenworth, Kan.

THE CITY ENGINEER of Worcester, Mass., is to be sent by the City Council to Europe to investigate sewerage systems.

A. A. ROBINSON has been appointed General Superintendent of the Atchison, Topeka & Santa Fe road. He will continue to perform the duties of Chief Engineer.

RALPH MODJESKA, son of the actress, is an élève of the Ecole Polytechnique of Paris. He proposes to settle in this country and pursue civil engineering, his special study being roads and bridges.

MR. T. STANLEY NEDHAM, of White Plains, New York, who was one of the civil engineers of the George's Creek and Cumberland Railroad, was married on the 19th ult., to Miss EMILIE M. CROMWELL, of Bedford, N. Y.

MR. ROBERT MCCLELLAND, of the firm of DeGollyer & McClelland, the Nicholson pavement contractors, died Saturday morning, the 29th ult., at his residence, No. 3570 Ellis avenue, Chicago, after a protracted illness, during which his wife died.

ROBERT M. JAMISON, for several years a civil en-

gineer on the Philadelphia & Reading Railroad, but recently discharged from its service, committed suicide in a fit of temporary insanity, on the 28th ult. He was 43 years old and leaves a widow and three children.

MR. C. R. WISE, Chief Engineer Brunswick (Ga.) & Western R. R., will hereafter, in addition to his other duties, have charge of the track, water stations and depot buildings of that company. Bridge carpenters, supervisors, etc., will report to him. By order of H. S. MORSE, General Manager.

THE GOVERNMENT ARCHITECT.—The following named persons have applications on file in the Treasury Department for the position of Supervising Architect, to succeed Hill: E. E. Myers, Michigan, recommended by the Michigan Congressional delegation; John Frazier, Washington, recommended by Senators Cameron, of Pennsylvania, and Van Wyck, of Nebraska; Gordon P. Cummings, of Philadelphia, and J. P. Law, Washington. The last named is at present in charge of the draughtsmen's division of the Architect's office.

MILES ROCK, Assistant Astronomer at the U. S. Naval Observatory, has been appointed Engineer Commissioner by the government of Gautemala, to determine the exact boundary line between Gautemala and the Mexican provinces of Chiappas and Soconusco. Five commissioners have been selected by each government. Mr. MILES' associates are all residents of Gautemala. The Commission will meet at a small Mexican town near the proposed line on Nov. 1. If time permits, Mr. ROCK intends to make a topographical map of a zone of country on each side of the border, as a good beginning for a series of maps of Central America, which is as yet very inaccurately surveyed. He is also commissioned by the Smithsonian Institute to note such ancient ruins, etc., as he may encounter in this little known country, and for this purpose takes with him a photographic outfit.

WHILE the newspapers of this whole country are telling every day what tremendous work Bookwalter is doing in Ohio slaughtering Pendleton and getting ready to put himself into the Senate, it is a singular fact that he occupies every day his business office in Liberty street, in this city and spends his evenings almost invariably either in reading or in quiet social intercourse with ladies and literary friends. He is a man somewhat above the medium height with a trim figure and with a rather military countenance, the nose straight, the skin pale and aristocratic, the eyes dark and somewhat stern, but the general address reliant and cheerful according to circumstances. He was a poor boy, a farmer's son brought up in Indiana in the Wabash Valley not far from Logansport. He had hardly any advantages of education. His father had been an emigrant to Ohio from Berks County, Pennsylvania. Mr. Bookwalter has been a reader all his life and probably is one of the best-informed men at present with public intentions. He has been around the world, and everywhere examined matters on which he was previously acquainted, beginning with some of the leading evolutionists in England, with whom he had previously corresponded, and ending with engineers and projectors in India. He has a great idea of the development of China and Japan under modern civilization. He has been a widower many years, and has a large library and a remarkable museum. He publishes a journal devoted to his manufacturing interest here, and told me that he had 1,400 local agents for his different manufactures, in Europe and South America. One of his notable manufactures has been turbine water-wheels, which furnish light manufacturing power from streams all over the globe. Probably no public man in Ohio since Garfield has done as much manly reading for self-respect's sake.—*N. Y. Tribune.*

OBITUARY.

SAMUEL S. MONTAGUE, late Chief Engineer of the Central Pacific Railroad, died at Berryvale, Cal., on Sept. 24; he was born in Rockford, Ill., about 1837. Previous to 1863 Mr. Montague was assistant to Chief Engineer Judah, of the Central Pacific, and upon the death of the latter, in the year mentioned, he succeeded to the duties but not to the title of his former chief. For some reason hard to understand, this official recognition of his arduous labors and brilliant engineering achievements was not accorded him until March 1, 1868. To Mr. Montague belongs all the credit for the location and construction of the Central Pacific, one of the most difficult pieces of railway work of any country; he succeeded in building his road in the face of natural obstacles declared insurmountable by English engineers who had previously examined the route and protected his work after it was built, from the destructive avalanches of the Nevadas, by the famous timber snow-sheds, so often described. Mr. Montague was also Chief Engineer San Joaquin Valley R. R., as far as Goshen, and of the California & Oregon R. R.

He is described by those who knew him as a man of an extremely modest and unassuming disposition, and as one thoroughly respected and beloved. But as an engineer he was bold, full of expedients, and conquered success in all his undertakings. His achievements will never be fully appreciated until a history of the many engineering wonders accomplished in the construction of the Central Pacific is better known to the world.

THE NAMES OF THE STATES.

THE ORIGIN OF THE TITLES OF A FEW OF THEM.

[From an Exchange.]

Ohio takes its name from the river on the southern boundary. The word is from the Wayandotte Indian dialect, "O-he-zah," and means "something great."

Iowa is named from the river of that name. The river is named from the Ioway Indians.

Missouri was also named from a river. The word is from the Indian Mis-he-sho-shay, signifying "muddy water."

The name of Wisconsin is of French-Indian origin. It was formerly spelled Ouis-con-sin, meaning "western flowing."

Illinois is derived from the Delaware word "Illin," or "Leni," meaning "real men," and the soft French termination "ois."

The name Michigan comes from the Indian words of Algonquin and Chippewa origin, "Mitcha," great, and "gan," lake.

Louisiana was called in honor of Louis XIV., of France, and formerly applied to the French possessions in the Mississippi Valley.

The word Arkansas is of Indian stock. A tribe of Indians who rebelled and separated from the Kansas nation were celebrated for the fine qualities of their bows. From this they were called Arc or Bow Indians, and afterward Arkansas.

Maryland was named from Queen Henrietta Maria. In the chapter the name in Latin was *Terra Mariæ*, meaning land of Mary, or Mary's Land.

Virginia was called in honor of Queen Elizabeth, who was known as the Virgin Queen.

The territory of the Carolinas was granted to the French settlers in 1662, and named after Charles I. of France.

King George II., of England, was the sponsor for the Southern State of Georgia.

The name of Maine was given to that State descriptively, since in the original charter it was considered "the Mayne land of New England."

Vermont was also a descriptive name, being formed from two French words "verd" and "mont," meaning green mountains.

Kentucky is from Kentuckee, an Indian Shawnoese word, signifying the "the head of a river," or "long river."

Mississippi is from the Indian Meesyseedee, meaning not the "father of waters," but "the great water."

Colorado is named for Rio Colorado. The name is of Spanish origin, and means "ruddy" or "red," referring to the color of the water in that river.

Tennessee is supposed to have been named from Tenas See, one of the chief villages of the Cherokee Indians, which was located on the banks of the Tennessee River.

The name of Minnesota is from the Indian Minnesotah, meaning "colored water."

The State of Nevada is named from the Sierra Nevada Mountains, which in turn are said to have been named from the Sierra Nevadas of Grenada.

Nebraska takes its name from the Nebraska River. The name is of Indian origin, meaning "Shallow River."

Kansas is also named from its principal river. A tribe of Indians formerly in that locality were known as the Konsos or Kows, and the State is probably named from them.

The origin of the name of the penisular State of Florida is told by historians as follows: "In 1512 Ponce de Leon sailed from France to the West in search of the 'fountain of youth.' He first saw land on 'Easter Day,' and on account of the richness and quantity of flowers found on the new possessions he called it Florida."

Alabama is named from an ancient Indian tribe of the Mississippi Valley. The name signifies "here we rest."

Few States have been named after their original discoverers. The names of La Salle, De Soto, Marquette, Coronada and Fremont are waiting to be incorporated into history by the naming of some new States in their honor.

THE HISTORY AND STATISTICS OF AMERICAN WATER-WORKS.

BY J. JAMES R. CROES, M. AM. SOC. C. E.

(*Continued from page* 460.)

DLXVIII.—COHOES, N. Y.

Cohoes, New York, in lat. 42° 50′ N., long. 73° 40′ W., at the junction of the Hudson and Mohawk rivers, is on ground rising from the rivers to a height of 230 ft. The Great Falls of the Mohawk opposite the upper end of the city, with a descent of about 100 ft., the last 70 ft. of which is an abrupt fall, furnish a water power which is used on three levels for manufactories. The town was settled in 1725. The water power was utilized by the Cohoes Manufacturing Company in 1811, and was fully developed by the Cohoes Company in 1831. The village was incorporated in 1848, and a city charter procured in 1870.

In 1848 pipes were laid in the lower part of the village by the Cohoes Company, and water supplied from the upper level of their canal. In 1857 these works were purchased by the village for $6,000, and a pump driven by water power constructed to pump the water into a reservoir holding 3,000,000 gallons at 200 ft. above the Hudson River. In 1869 another reservoir holding 8,000,000 gallons, at 230 ft. above the Hudson River, and another pump erected. The first pump, erected in 1857, is of 10-in. bore and 60-in. stroke, driven by a 48-in. Geyelin turbine, under 14 ft. head. The second pump, erected in 1869, is of 16-in. bore and 72-in. stroke, and is driven by a 54-in. Jonval turbine. The 10-in. force main to the old reservoir, the 16-in. force main to the new reservoir and the distribution pipes laid at first are of cement-lined wrought iron. Cast-iron pipes are now used for all extensions. The distribution is by 3.8 miles* of pipe of from 14-in. to 2-in. diameter, with 175 fire hydrants and 1,400 taps. Galvanized wrought-iron service pipes are used. The population in 1880 was 19,418. The daily consumption in 1883 is 1,500,000 gallons.

The works have cost $150,000. The bonded debt is $180,000 at 7 per cent.

The expenses for the year ending February, 1883, were $11,845.88, and the receipts $21,982.81. The works are managed by six Water Commissioners and the Mayor, who is ex-officio a member of the Water Board. W. E. Thorne is President of the Board, and A. T. Kniffen the Superintendent.

* The report from the Water Commissioners' office gives the length of pipe as 20,811 ft. The amount is very small for the size of the city and the number of hydrants and taps.

CHANGES ON THE MOON.

WHERE A SUSPENSION BRIDGE 40 MILES LONG WOULD BE NOTHING TO SPEAK OF.

The first fall meeting of the American Astronomical Society took place Oct. 1 in the Parker Institute. Among the new members elected were three ladies of scientific attainments. Mr. G. P. Serviss, Secretary of the society, read a paper on the "Changes on the Moon." He said that if the moon was inhabited engineers there would be able, on account of the slight force of gravity, to build a suspension bridge across a volcanic crater forty miles in diameter, or in building railroads to tumble mountains out of the way like molehills.

"Although the moon is a dead planet," he continued, "yet changes do take place on its surface. Craters have sunk probably by the crumbling of a mountain wall. Humboldt noted a similar phenomenon in the falling in of the top of the Capac Urcu, or Prince of Mountains, in Ecuador, in the fifteenth century, which dropped over 3,000 ft. In 1866 Schmidt of Athens missed the crater of Linne from the Sea of Serenity in the moon. It was six and a half miles across, and, Prof. Proctor says, perhaps three miles deep. Only a slight elevation now marks the place where the mountain stood."

Prof. Stevens suggested that the mountains in the moon might crumble in consequence of the different temperatures on the side of the moon presented to the sun and on that which is turned away from the sun. As there could be little atmosphere around the planet, the side next to the sun must be almost like molten lead, while on the opposite side it must be like ice. Expansion and contraction of the towering volcanic masses might weaken them, and in time cause them to tumble. Prof. Eaton did not believe that the as-

tronomers had recently discoverd vapor as they had hoped.

Prof. Parkhurst said he had not the slightest doubt that the comet recently discovered by Brooks is the comet of 1812. It is considerably ahead of time, and is further from the sun than the comet of 1812, but in every other respect the comet resembled that of 1812. It had a very faint light like a nebula when first seen, but a few days ago it blazed up with wonderful fierceness, and has now resumed its somewhat nebular appearance.

A SCALE OF HARDNESS FOR METALS, BY H. GOLLNER.

[Technische Blätter des Deutchen Polytech-Vereines in Böhmen.]

The author describes a scale of hardness in use in the laboratory of the Technical High School at Prague, composed of the following 18 metallic substances, arranged in ascending order from the softest to the hardest.

1. Pure soft lead.
2. Pure tin.
3. Pure hard lead.
4. Pure annealed copper.
5. Cast fine copper.
6. Soft bearing copper (copper, 85; tin, 10; zinc, 5).
7. Cast-iron annealed.
8. Fibrous wrought iron.
9. Fine-grained light gray cast-iron.
10. Strengthened cast-iron (melted with 10 per cent. of wrought turnings).
11. Soft ingot iron, with 0.15 per cent. carbon (will not harden).
12. Steel, with 0.45 per cent. carbon (not hardened).
13. Steel, with 0.96 per cent. carbon (not hardened).
14. Crucible cast steel, hardened and tempered blue.
15. Crucible steel, hardened and tempered, violet to orange yellow.
16. Crucible steel, hardened and tempered straw yellow.
17. Hard bearing metal, copper 83; zinc 17.*
18. Crucible steel, glass hard.

The test is made by drawing a cylindrical piece with a conical point along a polished surface of the metal to be tested. In the case described, that of a bronze used for the cross-head guide of a locomotive, the point, when loaded with 5 kilograms, was drawn six times through a distance of 3 centimetres. Under these conditions the points of the number below 5 in the scale were blunted without marking the surface; with Nos. 5 and 6 neither point nor surface was abraded; but with No. 7, while being slightly worn on the point, began to scratch the surface. The hardness was, therefore, that of pure copper or soft bronze. The absolute tensile resistance was found to be 2051.7 kilograms per square centimetre, while that of copper is 1920 kilograms per square centimetre, and that of the bronze, No. 6, is 2300 per square centimetre, thus showing an intimate relation between the strength and hardness of similar metallic compounds.

IN GUATEMALA.

STANFORD & CO. BUILDING ANOTHER RAILROAD.

A gentleman residing in Guatemala writes that Stanford, Huntington & Crocker are building a railroad from the city of Guatemala to the Pacific shore and from the city to the Atlantic, and President Barrios has levied a compulsory head tax of $4 a year, for ten years, on all inhabitants whose salary or income exceeds $8 a month, to assist in paying for the road.

The proclamation of President Barrios is as follows:

I, Ruffino Barrios, General of Division and Constitutional President of the Republic of Guatemala:

Considering—That the construction of a railroad from the port of St. Thomas on the Atlantic, built to meet the line that extends to the Pacific, would be the most important and urgent work that could be undertaken, to aid in the civilization, advance and enrichment of the nation.

That on the opening of this road depends the development of the extensive and fertile lands of the North and the actual cultivation of all the natural products that abound; the increase of population from the North, which the extension of the work will induce, and finally the great impetus to commerce and traffic that would follow in all parts of the territory from sea to sea.

That the Government, persuaded of the great need of the country—for this road has not ceased in its efforts to help the project—granting privileges and concessions, which, although justified by the importance of the objects in view, will still involve valuable sacrifices to and a certain dependence on a foreign company that might undertake to carry out the project.

That notwithstanding the concessions and privileges which the Government was disposed to grant and authorize in order to insure the republic, it was found impossible to effect a sure and suitable agreement for the construction of the said road.

That considering the favorable increase of public wealth and the more general ease that prevailed, the patriotic idea might be carried out of executing the great work of the Northern Railroad with the national resources, and that its execution, without being a burden or painful effort, would, on the contrary, be a benefit to those who helped to aid the work and to their heirs and successors.

That apart from all this, the republic would obtain an immense advantage by the economy of three-fourths of the expense that would be called for by a foreign company and by obviating the necessity of onerous grants and privileges to such company by doing the work alone, which consideration should have great weight with the patriotic inhabitants of Guatemala who desire to help the national work.

That in order to obtain the resources necessary for the enterprise, a small contingency from the generality of the Guatemala people would be sufficient. Therefore, by virtue of the powers vested in me, I decree:

ARTICLE I. The railroad that is to unite the port of St. Thomas on the Atlantic, touching in its course the most important commercial and agricultural points of the east and north of the republic, shall be constructed at the cost of the nation.

ART. II. To this end an obligatory national subscription shall be raised, reduced to the small rate of $4 per annum for the period of ten years, which shall commence on the 1st of January, 1884, and this should apply to the inhabitants of Guatemala whose income from official position, days' work, salary or other sources, is not less than $8 per month.

ART. III. The payment of the subscription shall be made quarterly in installments of $1 in each of the months of March, June, September and December of each year.

ART. IV. Each subscriber shall be registered from the beginning as a shareholder of the Northern Railroad Company, with all the rights and privileges accruing from the amount of his subscription.

ART. V. Every one amenable to the subscription who refuses to pay this compulsory contribution shall be compelled to do so after the last day of the three months, and to be fined in equal amount extra, which fine shall be paid into the railroad treasury as an extra contribution to the enterprise.

ART. VI. Foreigners resident in the country are permitted to take shares in the national subscription under the general rules and regulations of the enterprise.

* Per original; probably tin is meant.

SPEED ON RAILWAYS.

THE RATE AT WHICH THE GREAT EXPRESSES TRAVEL.

[From the Albany Journal.]

"It isn't because our engines can't do it that the railroad trains in this country do not run as fast as they do in other countries," an engineer on the New York Central said yesterday to a *Journal* reporter. He had been shown a published statement that the time made in the United States was very slow compared to the schedules in force abroad, particularly on the English lines. "When there is need of it," the engineer continued, "we prove the capacity of our locomotives and roadbed to increase the speed to the highest limit. But safety is preferred here to reckless speed. There are many of us who would be glad to send our machines at the rate of fifty miles an hour if the time table would allow it, and laugh at the little danger, but the rules are strict."

In the compilation of the relative speed of the fastest trains in the world it is found that the limited express on the New York Central, running at about 40½ miles an hour between New York and Albany, ranks fourteenth. The regular trains on the same railroad, which average about 35½ miles an hour, are at the foot of the list. What is known as the "Flying Dutchman," running from London to Bristol, is the train which travels more rapidly than any other in the world. It completes a distance of 118½ miles, making no stops, in two hours, making an average of 59½ miles an hour. A train which runs between Paddington and Swindon, England, takes second place. The distance is 77¼ miles, the time 1 hour and 27 minutes, and stops none, and the average speed 53¼ miles. Germany is also progressive in this matter. On the railroad between Berlin and Hanover a train is run which makes the 152½ miles in 3 hours and 48 minutes, keeping up an average of over 51 miles an hour. The train from London to Peterboro comes next, covering 74½ miles in 1 hour and 29 minutes. This is on an average of 51½ miles. Canada is ahead of the United States as far as expeditious railroad transportation is concerned, a train on the Canada Pacific, from Coteau to Ottawa, making 78 4-10 miles in 1 hour and 34 minutes, or 50 miles an hour, including three stops. The Pennsylvania Railroad runs the fastest train in this country between Jersey City and Philadelphia, a distance of 90 miles. It makes one stop and reaches its destination in 1 hour and 52 minutes. The average per hour is 48 3-10 miles. Other trains are as follows: England—London to Edinbora, 399 miles, 9 hours, average 45 miles; Pennsylvania—Bound Brook route—Jersey City to Philadelphia, 89 4-10 miles, 2 hours, 5 stops, average 44 7-10 miles; Boston to Providence, 44 miles, 1 hour, no stops, average, 44 miles; New York, Boston & Providence, 64 miles, 1 hour 35 minutes, no stops, average 41 2-10 miles; Grand Trunk—Montreal to Coteau, 37½ miles, 55 minutes, 1 stop, average 41 miles; Canadian Pacific—Montreal to Ottawa, 120 miles, 2 hours and 55 minutes, 3 stops, average 41 miles; New York Central—Albany to New York, 142 miles, no stops, 3½ hours, average 41¼ miles; Baltimore & Ohio—Baltimore to Washington, 40 miles, 1 hour, 1 stop, average 40 miles; New York to New Haven, 74 miles, 1 hour 52 minutes, no stops, average 39 7-10 miles; Boston & Albany—Boston to Springfield, 98 miles, 2 hours 34 minutes, 3 stops, average 38 2-10 miles; New York to Chicago, 913 miles, 25 hours, average 36½ miles.

BAD GOVERNMENT OF CHICAGO.

(From the Chicago Tribune.)

It is not very long ago that a prominent tax payer went to Mayor Harrison with a conundrum which the latter was not able to answer. He stated his case as follows: "As a merchant and a citizen I pay about $100,000 a year for local taxation. In addition thereto I pay the cost of constructing the pavements for streets where I own property: I pay for all the water consumed at my places of business and my home, besides the Waukesha water which I and my family drink. If the streets in which I am interested are cleaned at all, it is at private cost, in which I participate. I police my own house and business by hiring private watchmen. Now, what do I get for my money?" The question was a poser. The citizen who asked it added, in a spirit of fairness, that he obtained and appreciated the service rendered by the Fire Department, but aside from that single item he was unable to discover any personal compensation for the enormous sum of money he paid annually for the support of local government. Every tax-payer, large and small, has reason to puzzle himself over the same problem, for he pays his proportion for the support of city government, and over and above that amount, whatever it may be, he pays extra for almost every item of personal necessity, protection and safety which local government is supposed to provide. The blame for this condition of things rests upon the inefficient character of the city government.

TRICKS ON TRAVELERS.

The Salt Lake *Tribune* exposes a decidedly good trick practiced by the Union Pacific upon unsuspecting tourists:

Not long ago the Burlington & Missouri Railroad started an antelope ranch near its track, and kept tame antelopes to turn loose when a train was due, and when a train came in sight the little animals would scamper off toward the ranch, and the passengers would get excited and swear the plains were full of game. The Union Pacific road heard about antelopes on the Burlington & Missouri, and the officers decided to do something to hold over its rival, and the matter was left to Mr. Egbert, of Denver, one of the officers of the Union Pacific, and shortly it was announced that buffalo and elk had been seen by passengers on the Union Pacific trains, grazing by the side of the track within gunshot.

Mr. Egbert was happy and said these other roads could talk about their little antelopes and prairie-dogs, but when you wanted big game you should take the Union Pacific. It is said the thing worked well until last week, when Mr. Clarke, General Superintendent of the Milwaukee & St. Paul, was out that way with his special car and a party of friends. Mr. Clarke was formerly connected with the Union Pacific, and Mr. Egbert was doing the honors. As the train sped along and the party were playing draw poker, Mr. Egbert, who knew about where the buffalo and elk would show up, called the attention of the gentlemen to the landscape, and just then the wild animals stuck up their heads, and Mr. Bird, who can see better than the rest, said: "Elk and buffalo, by the great jumping Jehosophat!" and he started for the store-room for a pepper-box revolver.

Col. Johnson laid down his hand, put on his glasses and looked at the animals and said: "By George, it is the finest sight I ever saw, except four aces." The train was slowing up, which made Mr. Egbert nervous, but he said: "Gentlemen, the plains are full of wild animals on this road. It is no uncommon thing to go out of a morning and kill a dozen before breakfast." He looked a little nervous, as though wondering why the cowboy who had hold of the ropes on the other side of the knoll did not jerk on the animals and make them prance around a little. Clarke did not say anything, but

he kept up a terrible thinking. Mr. Egbert said the animals were tired or they would have gone across the prairies on a stampede at sight of the train, and Bird and Johnson believed it, but Clarke had lived there before.

Just then the train came to a full stop owing to a hot box, and the passengers got out to see what was the matter, and the elk and the buffalo came down toward the train. Bird went back in the train to get his gun, and Johnson got upon the platform for fear of being gored, and when Bird came out with his pepper-box the elk was licking Mr. Egbert's hand and the buffalo was rubbing his nose against Clarke's boot, as though the animals had known the two gentlemen before. Egbert blushed like a school-girl as his deceived friends came out of the car, and when Clarke said, "Egbert, I guess that elk is the one the Piute Indian used to drive to a cart in Cheyenne to haul water, isn't it?" It seemed as though Egbert would have given $10 to have got hold of the cowboy who did not attend to his business and scare the game away from the train.

Col. Johnson got down off the car when he found there was no danger, and after examining the buffalo he said it was the same one that was exhibited at the Wisconsin State Fair two years ago, and then the train started off, leaving the elk and buffalo bellowing after it as though they wanted to be petted.

DEATH OF A WELL-KNOWN RAILROAD ENGINEER.

[From the Salt Lake Tribune.]

The death of S. S. Montague was announced by wire on Wednesday. He was a chain-bearer under T. D. Judah, first Chief Engineer of the Central Pacific Railroad, and by his abilities was given his chief's place when Judah died. For twenty years he remained in the company's employ, and died in his surveyor's camp, up under the shadow of Mount Shasta. He laid out the line of the road above Colfax, changing Judah's line, locating the road by Cape Horn. He invented the Central Pacific snow-sheds; he has been the authority which has finally settled all points of construction on the Central Pacific and Southern Pacific, and when arrested by death was at the post of duty up on the California & Oregon, where the majesty of the Sierras makes it difficult work for the engineer to map out a smooth pass over them. In private life he was as modest and genial as he was great in his profession. He died of consumption at 46 years of age, and leaves a wife and brood of little children.

THE PALESTINE CANAL.

There is a proposition before the British public for a canal between the Mediterranean and the Red Sea, following the great depression of the Jordan Valley. There is no great prospect that it will ever be made; but the sudden and hot objections against it, poured out in letters to *The Times*, *The Guardian*, and other papers, show that the idea that a canal may have locks has not occurred to the objectors, if it did to the projectors. They complain that the waters of the ocean once let in, would cover to a depth of hundreds of feet the whole valley of the Jordan, obliterating forever not only the river itself, but effacing every sacred site along its course from Tiberas, Capernaum and Bethsaida to Jericho, with the sea of Galile and the Dead Sea. That would be very a serious thing; and no wonder that they petition the British Government not to give the loan of forty million dollars at three and a half per cent., which the secretary of the "Jordan Valley Canal Company" has asked for. But there is another side to this. What if it should turn out that there is a prophecy of the Jordan Valey Canal Company in the Bible? Indeed the Rev. W. J. Stracey, of Buxton Vicarage, Norwich, has discovered one; and, remembering "that no prophecy of Scripture is of any private interpretation," but concerns all nations, he thinks the canal will be made. For read the forty-seventh chapter of Ezekiel, and see what it means, bearing in mind that Jerusalem stands 2,400 ft. above the Mediterranean, and the Dead Sea 1,300 ft. below the same level. Were the canal to let the waters of the Mediterranean into the Jordan Valley they would flow far up the Kerdon Valley toward Jerusalem, first "to the ankles," to one coming down from Jerusalem, as did Ezekiel and the angel in vision, then "to the knees," then "to the loins," then "waters to swim in, waters that could not be passed over." And be it further observed that Ezekiel (vss. 8—10) says that the waters shall flow in such abundance into the Dead Sea that its deadly waters shall be healed, and fish shall live there, "as the fish of the Great Sea," that is, the Mediterranean. Certainly that would be the result, though Mr. Stracey does not explain some difficulties, such as the representations of the prophecy that the waters were to flow out from under the threshold of the rebuilt temple at Jerusalem. But such little difficulties as that we have noticed never trouble a determined expounder of prophecy. They who are on the lookout for the fulfillment of prophecy will always find prophicies to fulfill. And does not Zechariah (xiv, 8) tell us that there shall be water communication from Jerusalem with both the Mediterranean and the Dead Sea, never failing, "in summer and winter" alike? The fulfillment of prophecy is more important than any sentiment about the preservation of sacred sites. Let us have a canal without locks, and we make a present of this interpretation of prophecy to our Restitution and Second Advent friends.—"*Es ist geschenkt.*"

NEW PROCESS OF BRONZING IRON.

[From Dingler's Polytechniches Journal.]

Clean with care the object to be bronzed, and expose it for about five minutes to the vapors of a mixture of hydro-chloric and concentrated nitric acids, mixed in equal parts; then warm the object to a temperature of 300° to 350° until the bronze color appears. After cooling, the object is rubbed with paraffine and again heated until the paraffine commences to evaporate; this last operation is repeated twice. If the vapors of a mixture of hydrochloric and nitric acids are used, the color obtained will be a light reddish-brown. If to these two acids some acetic acid is added, the coat of oxide will be a beautiful yellow bronze in appearance. By varying the mixture of acids, all grades of color from a light to a dark red brown and from a light to a deep yellow bronze can be obtained.

Prof. Oser covered in this manner rods of iron 5 ft. long and after ten months' time, during which they have been constantly exposed to the acid-charged air of his laboratory, they have shown no signs of alteration.

NEWS OF THE WEEK.

OLEAN (N. Y.) has accepted the terms of the Keystone Gas Company.

NEW MILFORD (Conn.) has a new water dam, 250 ft. long, 21 wide at foundation and 5 ft. wide at top. It will contain 15,000,000 gallons. Cost, $16,000.

THE Washington, Cincinnati & St. Louis has been sold for $30,000.

CANNON CONTRACT.—The South Boston Iron Co. is to manufacture one of Yates' cannon for the Government.

PENN. R. R. DEPOT IN JERSEY CITY.—If the tunnel under the Hudson River does not give an early prospect of success, the Pennsylvania's station at Jersey City must be enlarged; for the number of trains over different railroads going out of this station is extragavant. About sixteen passenger trains of the Lehigh Valley road alone go and come; the West Shore, and the Ontario, and Jersey Midland, and Susquehanna, and Amboy, and Long Branch, and Baltimore & Ohio, and all the branch and stem trains in Jersey of the Pennsylvania come and go, and of late huge autumn excursion trains to Mauch Chunk, Wyoming and the Waverly State Fair crowd the station at the morning and evening hours. In this and in other respects it is the leading railroad station of New York, and the great peach trains lie out on the Hackensack plains among miles of other freight cars, seeming to be like passengers crowding at the narrow ticket gate of the Bergen cut. If the tunnel is practicable and can be done within reasonable time, extensions at Jersey City will not be pressed, but a failure of the tunnel will probably lead to some extensive station being prepared there.

THE Revere Water Company will put in new works at a cost of $90,000.

THE BUREAU OF ENGINEERING OF NAVY DEPARTMENT.—Chief Engineer B. F. Garvin and Charles H. Loring are candidates for the position of chief made vacant by demise of Commodore Shoek.

WOMEN IN COLUMBIA COLLEGE.—Only two applicants have entered. Thursday is the day for mathematics. There is no danger of the ladies competing in the civil engineer's profession.

THE GEOLOGICAL SURVEY.—Secretary Teller has received the annual report of J. W. Powell, Director of the United States Geological Survey. The report states that the principal work accomplished during the past fiscal year was in the preparation of a large geological map of the United States. It is estimated that a scale of four miles to the inch will be necessary for this map, which will be published in atlas sheets. In the Pacific district the work outlined includes the survey of the Cascade Mountains in Oregon, northern California, and probably in Washington Territory. This region is believed to contain the grandest display of natural phenomena now known, and the investigation of it promises to supply matter of great importance to geologic science. The study of glacial phenomena was intrusted to Mr. Chamberlin, and he has been collating and grouping evidences of the former existence of a continental glacier similar to that which is believed to cover the greater part of Greenland. His purpose was to ascertain its former extent and distribution, its lines of movement, and the part which it has played in shaping the physical features of the country.

Prof. Irving has been laboring with great energy in the study of the metamorphic rocks in the Lake Superior region, and has made satisfactory progress.

Mr G. K. Gilbert has investigated the traces of the former existence of a large fresh-water lake in Western Nevada. Researches in the mining districts of Colorado have been made, and promise to throw much light on the theory of veins and their relations to the eruptive rocks with which they are associated. In the Gunnison district valuable beds of both anthracite and bituminous coal, of a quality unsurpassed in Colorado, have been found, and promise to make that locality one of the most important in the State. The ore bodies of this district also appear to be of much importance. The search for extinct vertebrate remains has been continued under the direction of Prof. Marsh, and its results have proved to be of great interest.

THE BRITISH SAVAGES.—Here is a translated extract from a pamphlet which is being distributed by thousands along the Chinese frontier, stirring up the people against the hated foreigner: "The Europeans do not belong to the human race. They are the offspring of monkeys crossed with geese. Their exterior is like that of apes, their habit like the devil's. Hence they are called Yang-Kwitze, or 'devils of Europe.' This race of savages adores neither heaven nor earth, does not honor the spirits, nor venerate ancestors. A very pack of dogs and pigs, they talk of nothing but 'equality,' and have no idea of the social hierarchy. They distinguish not father and son, king and servant. Those famous English, in particular, who are they? A little tribe, cooped up in a corner of the sea, in a country as big as one's hand. Their king may be indifferently male or female; the subjects are half men, half animals." So the English have to suffer when the French make war. How such savages could invent the wonders of steamships, railways, watches, etc., is explained by stating that these Europeans feed secretly—*à la* the Jews of Tiszla Essar—on the brains of Chinese children, and so imbibe their wisdom and skill.

FOR STATE ENGINEER OF NEW YORK.—Elnathan Sweet, of Albany and of the West Shore Road, has been nominated by the Democratic party.

UNION TOWN (N. J.) WATER SUPPLY.—The Hackensack Water Company has now completed mains to supply the town from a reservoir with a capacity of 16,000,000 gallons.

MR. BLAINE is a defendant in a suit brought by two creditors of the Richmond & Allegheny Company of which Mr. Blaine was one of the projectors. It is alleged that the stock of five million dollars was never paid in.

CALIFORNIA MILLIONAIRES.—During the last ten years some thirty of these envied gentlemen have died. In 1874 died James de Lavega, leaving $3,000,000, and W. B. Bowen, $2,000,000, found with a bullet in his brain; in 1875, W. C. Ralston, the banker millionaire who drowned himself, and E. C. Croker, of Sacramento, $3,500,000; in 1876, T. C. Manson, $1,000,000, and James Lick, several millions; in 1878, Mark Hopkins, a dozen million, and Michael Reese, worth several millions; in 1879 R. B. Woodward, $2,000,000; in 1880, Edward Martin, liquor dealer, $2,600,000, and Henry E. Robinson, $2,000,000; T. Mora Moss, $1,500,000; in 1881, William Meek, $1,000,000; Andrew J. Pope, $1,000,000; Louis Strauss, $1,000,000, and William Sahlein, $1,000,000; in 1882, Theodore Le Roy, $1,500,000; H. M. Newhall, $1,000,000; Daniel Murphy, several millions, and Daniel Cook, $2,000,000; in the current year, D. J. Tallant, $1,500,000; Hugh J. Glen, $1,000,000, shot by an assassin; H. B. Tichenor, $1,000,000, and Thomas J. Blythe, $5,000,000, with half a dozen widows to claim it. After all, some of them were not even happy in their deaths.

GRADING on the Louisville, New Orleans & Texas is now finished from Memphis to Clarksdale, and the bridging finished to 42 miles south.

THE TEXAS & ST. LOUIS.—President Paramore and Chief Engineer Stevens were lately at Corsicana, Tex.

THE Telfener surveyors have located the road to 20 miles from Corpus Christi. A thousand feet of low trestle will be required to cross the Nueces Valley.

NO city charter is wanted by Pautucket, R. I. Majority against 400.

LONDON trains number 2,200 in the twenty-four hours—or two a minute all day long. These do not include the Metropolitan service.

RAILROADS IN HONDURAS.—President Soto was recently in San Francisco. Speaking of the Interoceanic road, he said: "I have made arrangements in New York for the completion of the road. The company has undertaken the work on its own account, and to finish the road by 1887. In return our government has made a concession of land,

and for 99 years the road will be the private property of the company." Of the 245 miles required only 27 miles have been built, but when completed the road will be one of the utmost importance as it will lessen the distance between New York and San Francisco by sea fully 1000 miles.

PURCHASE OF A DREDGE.—The Brazilian Government has had a dredge built in New York for use on the bar of the Port of San Pedro de Rio Grande. The boat is naimed the Iniciadora (Portuguese for pioneer). She is a stanch tug of 180 tons and 7½ ft. draught. Her engine is 260 horse power, and she has a 7 foot screw. Forward there are two pumps each capable of throwing 5,000 gallons a minute. The bar to be removed is 600 yards long and from 9 to 27 feet high.

PREMATURE openings of bids for supply of material for Philadelphia Water Department resulted in the bids sent in being rejected. Chief Engineer Ludlow offered an explanation, but it was decided to advertise again.

NAHANT'S (Mass.) water supply is not satisfactory and there is a movement to have pipes laid down.

SWAMPSCOTT (Mass.) is waiting to get its water supply from Lynn, which city has none to spare at present. It is suggested that the offer of the Marblehead Water Company should be accepted.

DOVER (N. H.) was to have a $50,000 Court-house, but there is a dispute about location, and the matter is postponed.

LAKE VIEW (ILL.) WATER-WORKS.—Bonds to the amount of $25,000 are to be issued for the purpose of enlarging the water-works.

THE Barracks on David Island, N. Y., are to be repaired and extended at an estimated expense of $147,000.

NEW RAILWAY COMPANY.—The Chippewa River & Menomonee Railway Company is to construct a line from Chippewa Falls to Lake Court O'Reille. The capital is $1,500,000.

NASHVILLE (Tenn.) has a water famine caused by the breaking down of the engines.

THE ST. JOSEPH & RIO GRANDE.—The surveyors are at a point 100 miles west. The surveyors are expected soon in St. Joseph, when Col. Young will go to New York.

A NEW CONTRACTING COMPANY.—The American Contracting Company has formed to build bridges, docks, wharves, depots, trestle-work. Capital, $5,000 , divided into 200 shares. A portion of the business is to be carried on at Norfolk, Va., Goldsboro, N. C., and Charleston, N. C.

LEXINGTON (KY.) WATER-WORKS.—The City Council, in special session on the 24th ult., appointed a committee to ascertain, with the help of a competent engineer, the sources of supply for water-works for that city and the cost of establishing such works.

LEXINGTON, Sept. 25.—At a meeting of citizens to-night at the Chamber of Commerce, water-works was discussed. A rough proposition was submitted by Mr. Lowree, representing a New York syndicate having water-works construction in hand, and which has just built works for Knoxville, Tenn. He offered to supply 3,000,000 gallons per day from the Kentucky River, if the city will rent two hundred fire-plugs at fifty dollars per year. The meeting unanimously decided that he should submit a proposition in writing to the joint committee from this meeting and from the City Council, said committee to submit to him the length of pipe to be laid in the city.

MYSTERIOUS SURVEYORS.—The *Pittsburgh Commercial Gazette* says: Six corps of engineers are at work locating the line of a railroad along the north shore of the Monongahela River, from the Tenth Street bridge to Braddock. They are under the command of T. M. Roberts, of the Pittsburgh East End road, and are acting very mysteriously, apparently with the intention of hiding their work. Who they are working for they do not know, and Secretary Christig, of the P. E. E., says Roberts does not know who the projectors are, and that he is receiving his instructions from a contractor named Devlin, one of the builders of the Castle Shannon road. The line generally runs through the water and is believed to be intended to be reserved for the entrance of a new road. Superintendent King, of the B. & O., denies that they have anything to do with it, as does Chief Engineer Wainwright, of the Pittsburgh, McKeesport & Youghiogheny railroad.

ELECTRIC COMPANY.—The Philadelphia Sectional Electric Underground Company has filed plans with Department of Surveys.

IN Kansas City (Mo.) there is considerable difficulty in letting paving contracts. The contract for paving Main street having been declined by Messrs. Comstock & Halsey, the city engineer tendered it to Messrs. Taylor & Son, the next lowest bidders. They have referred the petition to their attorney, and as yet the city engineer has received no notification from them. There are several other projects in *statu quo*.

THE survey of Cajon Pass is to be resumed.

RAPID TRANSIT ON STATEN ISLAND.—The Commissioners appointed to appraise the value of the land required by the Staten Island Rapid Transit Company are now taken testimony. The contract for building the entire line has been let to Smith & Ripley, of New York. It is expected that the completed road will be in operation by the first of September next.

RAILROAD FROM ATTICA TO YOUNGSTOWN, N.Y.—Col. R. H. Stevens, of Attica, a railroad contractor, has been organizing this project. The distance is 60 miles, and no difficulty in completing arrangements is looked forward to.

ROAD IN THE SAUGATUCK RIVER VALLEY.—A line from the Saugatuck station, ten miles up the valley is spoken of, and President Watrous has made an offer to lay the rails and divide profits with the people of Westport.

THE Edison Electric Light has been introduced at Brockton, Mass.

RAILROAD BUILDING IN 1883.—Last week there was constructed in the United States a total of 308½ miles of new railroad, making 3995 miles thus far this year.

THE Pensacola & Mobile Road will be probably built by the Louisville & Nashville.

KENTUCKY UNION CONTRACT.—C. R. Mason & Co., of Frankfort (Ky.), received contract for first eight miles.

THE NEW ORLEANS & NORTHEASTERN.—Geo. B. Nicholson, Division Engineer, reports work progressing well. Major S. Whinery, Engineer of the Northern Division, has also returned to New Orleans.

NEW ORLEANS LEVEE CONTRACTS.—The Board of State Engineers willl open bids to-day (Oct. 8) for the construction of several levees.

BOSTON'S WATER METERS.—It appears that after all no change can be made at present; to make the Tremont meters an entire new set of tools and machinery must first be manufactured, and the cost of this plant would be in the vicinity of thirty thousand dollars. The Boston *Journal* calls for another test of meters.

ASCENT OF MOUNT SHASTA.—On September 11, Professor Gilbert Thompson, of the United States Geological Survey, made the ascent of Mount Shasta with two saddle mules. It is noteworthy as the first successful attempt to take animals to the summit.

BOONE (IOWA) WATER-WORKS.—Contract has been awarded to George C. Morgan & Co., of Chicago, for $17,785.

LEMAR'S (DAK.) GAS-WORKS.—J. H. Miller, of Sioux Falls, asks a franchise for putting in gas-works.

ST. LOUIS STREETS.—A great many streets were paved this season and work is going on on several more. All the business part of the city will soon be paved with granite.

THE Kingston, Warwick & Easton Railroad Company have been incorporated. The line will run from Greycourt to Montgomery in Orange County, N. Y. The distance is 15 miles.

NEW HAVEN BRIDGE.—City Engineer Hill reported at last meeting that Barnesville bridge was so dilapidated that it could not be repaired. The estimate for a stone bridge is $13,000. Estimates had also been made for a single-span iron bridge of 40 ft. spread, which would cost $8,700. Mr. Hill recommended the construction of such a bridge. It would prove as strong and substantial as a 25-ft. span bridge, and would cost less. At a meeting of the committee on bridges it was stated that the present bridges over Court, Grand and Fair streets were not safe. The railway company must built proper bridges, but can select either wood or iron.

THE MILWAUKEE & ST. PAUL.—Three thousand men are working on the extension from Cedar Rapids to Ottumwa.

THE Canada Pacific will have laid 946 miles of road during the present year. 1,902 miles have been built and 981 are under construction.

THE MARKET STREET (PHILADELPHIA) BRIDGE.—An effort was made in the Council to have estimates given for an iron as well as for a stone bridge. The bridge will be of stone.

THE ELECTRIC LIGHT IN WASHINGTON.—A company is being organized for utilizing the Great Falls water power for lighting the city by electicity.

COURT-HOUSE AT FRANKFORT, KY.—The following is a synopsis of the bids for basement and area walls for the court-house, etc., at Frankfort, Ky., opened Oct. 1, 1883.

The Belknap & Dumesnil Stone Company, $6,600.

John Haley, $8,780.

The contract has been awarded to the Belknap & Dumesnil Stone Company, of Louisville, Ky.

BRIDGE CONTRACT.—The bridge across Bush Creek, Kansas City, will be built by the Kansas City Bridge and Iron Works. William Z. Hickman was appointed Superintendent of the Troost Aven Extension.

THE ELECTRIC LIGHT IN WILMINGTON (DEL.)—The contract for the Arnoux Electric Light building has been given to Bailey & Hughes.

THE TEXAS LEVEES.—P. J. Kennedy is contractor for these levees, and comp'aint is made that work is progressing too slowly. 500,000 cubic yards have yet to be put in, and there are only 50 men at work.

MARINE HOSPITAL AT NEW ORLEANS.—The following is a synopsis of proposals for building a marine hospital at New Orleans, opened Sept. 28, 1883:

J. M. Marshall, $63,342.
Ferdinand Rensch, $63,433.
S. M. Gix, $64,000.
The award has not yet been made.

NEW YORK DOCK IMPROVEMENTS.—Owing to a legal decision against the corporation, and which affects the right to the water front, several works of improvement have been stopped.

CHICAGO CONTRACTS LET.—The contract for macadamizing Vincennes avenue, from Douglas to Egan avenues, has been given to George W. Wilson. The contract for sewers in Robey street, Homan avenue and Curtis street were awarded to Reilly & McDowell. Also for sewers in St. Clair street, from the river to Ontario street, were given to John Lyons.

THE NORTHERN PACIFIC.—Gen. Anderson, Chief Engineer, was at Fargo, Dak., lately, and reported that the Mullane tunnel would be completed this month and the Bozeman tunnel in January.

A CONTRACT REAWARDED.—Volk & Tocke, of St. Louis, who were the lowest bidders for constructing some marine hospital buildings in that city, $27,525, have failed to execute the contract and it has been awarded to Helm Bros., of St. Louis, the next lowest bidders, for $31,622.

WILMINGTON harbor is to have its wharf lines fixed by a competent engineer.

THE Paris, Georgetown & Frankfort will run a line 60 miles through Montgomery Co. for a subsidy of $100,000.

AN injunction has been granted Daniel Stanton and A. P. Balch, railway contractors, against the issue of $3,000,000 worth of bonds of Canada & Atlantic on part of Grand Trunk road.

THE water supply in New Orleans has been cut shorter than usual by the action of the Water Works Company, and such distress has been experienced among the poorer class that a riot is feared.

THE contract for putting in gas-works at St. Cloud (Minn.), has been given to Patten & Jones, of Independence, Iowa, at $7,500.

THE brick conduit for the Portland (Me.) water-works is now finished at a cost of $120,000.

THE Yellowstone road is being surveyed by Messrs. Bothwell & Wallace. They were last at Fort Washakie. The line will be 250 miles in length.

THE SECTION-HAND'S SECRET.—Mr. Kimball, the present Vice-President of the Rock Island, took a seat behind two section men in a coach leaving Davenport for Chicago. The conductor came in and collected fare from one of the men, the other having previously paid. Said the latter, to gag his friend: "I can travel on this road whenever I want to, and never pay a cent." "How's that?" said the other. "It's a secret," said the first. Mr. Kimball pricked up his ears, and thought he had a good-sized "hen on." The Paddy who last paid his fare got off at a way station, and Mr. Kimball slipped into the vacated seat. "Have a smoke?" he said to the remaining Irishman. "How do you manage to travel without paying? I do a deal myself, and would like to know." "Would yez loike to know?" said Pat, looking cunning. "Indeed I would, and I'll give you $10 if you'll tell me." "No." "Fifteen." "No." "Twenty-five." "Done!" said the section hand, and the cash was forked over. "Be Jabers, I walk!" The same Pat is section foreman on the Rock Island, near Davenport.—*Chicago Tribune.*

THE COLUMBIA (S. C.) CANAL.—There are 180 hands now employed. Additional surveys have been made to locate the precise line of the canal.

HUDSON, MASS., WATER WORKS.—A public meeting to discuss the subject of a public water supply was held on Monday evening of this week. C. D. Munson, Esq., takes an active part in the matter.

SHEBOYGAN, MISS., WATER WORKS.—Wm. Elwell, Secretary of Water-Works Committee, writes us: "Our people have had several favorable propositions made to them by outside capitalists to build water-works. I am of the opinion that the works will be built by private capital when the right proposition is made. Our city is a prosperous manufacturing town, being one of the largest in the West; our population is now about 9000."

SEALED proposals will be received by the Department of public works of Chicago at their office until Monday, Oct. 8, 1883, for the erection

and completion of the extension to buildings at the West Side Pumping-Works. Bids will be received for the whole work complete or for the following classes of work separately: Masonry, cut stone, carpenter work, terra-cotta work, painting and glazing, and iron work, according to plans and specifications on file in said office.

WATER POWER DEVELOPED.—B. H. Hull, hydraulic engineer, of Bridgeport, Ct., went on Monday last to Mechanicville, N. Y., a place about 10 miles above Troy, to commence surveys for a large dam across the Hudson River. It is estimated that the dam will be about 1800 feet long; head and fall 18 feet; horse-power 20,000. A company has been formed, and land on both sides of the river purchased. The water power is considered very valuable and one of the best on the Hudson above Troy. A canal 100 feet wide and about 1 mile long, will be constructed on the west side for location of mills. Mr. Hull has been engaged to furnish the plans and take charge of the work. Railroads on both sides of the river and canal, make it a very desirable location for manufacturing by giving low rate of freight to all points.

THE Colebrook Valley R. R. and the Cornwall & Lebanan (Pa). R. R. were opened Oct. 1. These two lines form one system and were built by the wealthy heirs of the late Robert Coleman, the former owner of the immense iron deposits at Cornwall. The roads connect Lebanon, on the Lebanon Valley branch of the P. & R. R., with the Penna. R. R. at Conenago near Middletown, Pa.

A NEW CONDUIT COMPANY.—W. M. Singerly, John S. Davis, Joseph C. Herr, Henry H. Bingham, George McGowan, William F. McCully, Charles H. Gross and Alexander H. Boardman are the incorporators of the Philadelphia Sectional Electric Underground Company, which was incorporated August 17, and is to begin laying underground conduits in this city on Monday next. The capital of the company is $2,000,000, in shares of $50 each.

INJURY TO BRIDGE.—The masonry abutment of the Adams Street Viaduct, Chicago, was greatly injured, Sept. 28, by schooners striking against it.

NEW LINE IN IOWA.—Col. Birch has been lately traveling through Missouri and Iowa, organizing the Missouri division of a railway company from Kansas City to Des Moines. The line would be 225 miles in length.

THE line spoken of from Colorado City to Kansas would run *via* Honeywell or Dodge.

TWO iron bridges are to be built over the Auxvasse Creek (Missouri) at $3,000 each and an iron bridge over Cedar Creek.

HEAVY GRADES.—The engineers say that some of the heaviest grade work in the South is to be found on the line of the New Orleans & Mississippi Valley Railroad, between Port Gibson and Baton Rouge, a distance of 116 miles.

BALTIMORE RAILROAD NEWS.—There are very few new movements in local railroad affairs. The contractors on the Baltimore and Ohio's new line to Philadelphia have large forces of men at work, and much of the grading on the Maryland portion will be completed before the winter.

CHICAGO'S BRIDGES.—One of our evening contemporaries has interviewed the City Engineer with reference to the condition of the bridges in the city. That official announces that the Rush street bridge is too light for the traffic that passes over it; that the State street bridge is faulty in construction; that the Eighteenth street bridge is old and rotten; and that the Erie street viaduct is in a horrible condition. "It broke down," said he, "and we patched it up, but it is unfit for use and should be pulled down."—*Chicago Tribune.*

GRAND MARAIS AND VERMILLION R. R.—S. L. Bayless, Chief Engineer, states that the prospects are good of the road reaching Vermillion in sixty miles. Construction will begin in spring.

ROAD BUILDING IN TEXAS.—It is reported that work will begin on the extension of the Trunk Railroad from Jaufman, Tex., in a southeasterly direction. The rails for fifteen miles of road were contracted for on the 26th ult. This distance of road must be laid by November 7, in order to complete fifty miles of it, or the charter will be forfeited.

THE PENNSYLVANIA NEW BRANCH.—An inspection of route was made last week for an extension of the Schuylkill Valley road into the coal regions.

CONTRACTS LET.—The contract for the first eight miles of the Kentucky Union Railroad was given to C. R. Mason & Co., of Frankfort, Ky. The contract extends from the Chesapeake & Ohio Railroad southward, toward Red River Mills. Surveys on the other five miles are not yet furnished, but when they are this part will also be let.

SALINA (Ill.) water-works were recently formally opened.

DALTON (MASS.) WATER-WORKS.—Arrangements have been made to give the town a water supply. Engineer Tower has made the survey from the mountain three miles away, and estimates the cost at $15,000. A six or seven-inch pipe, with a 200 feet fall, will be laid.

LEGALITY OF CONTRACT.—The authorities of Lawrence County (Mo.) made a contract for building a bridge, agreeing to pay cash on completion. The treasury being empty when the money was due, the amount was borrowed, and a county order issued bearing 8 per cent. interest. The question arose as to whether the County Board has the power to issue interest-bearing orders. Attorney-General McCartney decides that they have.

GRAVING DOCKS FOR SAN FRANCISCO.—Some English capitalists, it is said, in consideration of a deed to certain blocks, the obtaining of certain roadways and the widening of the dry-dock basin, will construct two graving docks on a portion of the lands, of similar construction and capacity to the California Dry-Dock, or after the manner of and about the same dimensions as the graving docks lately constructed at the Royal Albert Dock, on the River Thames, or a combination of both.

SOUTH EVANSTON (ILL.) WATER-WORKS.—The Board of Trustees held a special meeting on the 28th ult., the object of which was to open and consider bids for boring one or more artesian wells for a water supply for the village. The bids were referred to a committee to open and report upon. The committee reported back the bids without recommendations. Five bids were received, varying from $4,300 to $6,060 for a 2,000-ft. well and from $2,975 to $3,750 for a 1,500-ft. well. The contract was let to Gray Bros., of Milwaukee, who offer to bore a well with a 5-in. internal diameter and a surface pipe from the surface to bed rock, 7 in. in diameter, the inner pipe to extend 25 ft. into bed rock, and packed with lead and rubber. They guarantee a flowing well. The price is $2 a foot for the first 1,200 ft., $2.25 for the next 300, $2.90 for the next 300, $3.40 for the next 200 ft., and $4,625, or for a 1,500 ft. well, $4 for the next 300 ft., or for a 2,000-ft well, $3,075. It is expected that a stream of water will be obtained with head enough to distribute itself over the town. If such a head is not obtained, an engine and pumping-works will be built to distribute it. The whole cost is expected not to exceed $17,000. If these operations are successful, of which there is little doubt, it will put an end to all hopes of annexation with Evanston.

NEWS ITEMS.—The Sanitary Council of Kentucky held its second meeting this week at Glasgow, Barren Co., Ky....Philadelphia contractors have to deposit security to the value of one-fifteenth their contract prices....All action upon fixing the salary of the Chief Engineer of the Philadelphia Water-Works is postponed for the present ....Clark street, Chicago, was placarded last week with announcements from the R. R. companies, of which the following from the Eastern Illinois is a sample: "We give a chromo and full-dress necktie with every ticket for Louisville." The fare is 50c. from Chicago to Indianapolis....Fare from New York to Albany by the "Father Columbia" steamboat "Block Island" is ten cents.... The American Bankers' Association will hold its annual session in Louisville, Ky., this month.... Laborers can find plenty of work on Corydon branch of the Air-line Railway, New Albany, Ind. ....Athens, Ga., proposes to build water-works.

THE IRON, METAL AND COAL MARKET.

PHILADELPHIA, Oct. 5.

A further reduction in pig-iron is probable, on account of the inferior stocks, especially of No. 2, and the difficulty in inducing consumers to cover requirements for the rest of the year. Business has been some what demoralized this week, and large transactions have not been heard of. A few of the makers of standard and special foundry claim that there is no decline in their makes, but, having very small stocks, if any, to offer, they do not meet with any competition. Ordinary foundry is selling at $21@$22 for No. 1, and $19@$19.50 for No. 2. Gray Forge holds its own well at $17.50@$18 at furnace. The conditions have not changed materially since last week, and there is no probability of large business until the downward tendency exhausts itself. The blowing out of more furnaces is more likely to take place than any further decline. Sales of about 4,000 tons of Spiegeleisen have been made at $30.25@$30.50. Large quantities are wanted at $30, and it is expected that business will be closed in a short time on a large scale. The downward tendency in refined iron continues, and the outlook is far from encouraging. One hundred-ton lots are exceptional, and can be placed only at greater concessions than manufacturers care to extend. Two cents has been offering, and several transactions are now pending on that basis. Construction iron for engineering requirements is in active demand, and there is less weakness in this department than in any other. The usual quotations are continued, excepting where large orders are taken, in which case concessions vary according to circumstances, running from one to two-tenths below quoted rates. A few thousand tons of old material have been sold for shipment. Old rails are offered at $23, and a few thousand tons will probably be ordered during the month, as stocks in consumer's hands are getting very low. Steel rails are without any activity.

PITTSBURGH.

The Western Pennsylvania iron market is in an unsatisfactory state for reasons which have been heretofore assigned. The local furnaces are well sold up, and expect to dispose of their entire output for months to come to meet the steady demand. Outside furnaces are unable to sell except at concessions, which run prices down to cost, if not below it. Forge iron averages $17.50, and foundry $18 to $21. Refined iron is correspondingly weak and dull. Some of the firms have secured contracts for from 30 to 60 days, but the greater number of the mills working on plain bar report weakness in demand and downward tendency in prices. Lowest sales heard of were at 1.75c., and the highest at 1.90c. The output of nails is heavy, and prices are firmer on account of the expected restriction next month. The mills on structural, plate and tank iron are better off than others. The Bessemer mills are working along quietly, seeking orders for winter delivery at $37. The glass trade is active for all kinds of material, and heavy shipments are moving eastward and westward.

CINCINNATI.

Heavy transactions in iron have been closed this week, at a drop from last week's prices, and buyers are taking advantage of the offerings of weak holders, to cover requirements for the rest of the year. Southern iron is coming in freely, and interfering with the northern product in a good many cases. Most of the southern furnaces are well sold up, and the reports of weakness made by some of the newspapers are somewhat exaggerated, although prices are low. The sheet and bar mills around Cincinnati and Covington are all busily employed, most of them with orders about four weeks ahead. Hanging Rock iron is in abundant supply, and no restriction of out put has been reported, although charcoal irons are very low. C. B. iron is selling more freely, on account of the decline in stocks in consumers' hands. In general, a downward tendency is exhibited, but in view of the fact that stocks are low, an active demand is likely from this time out.

CHICAGO.

Orders for nearly all kinds of pig iron are coming in, in greater numbers, and buyers who have been holding back for months are purchasing, although in small lots. Lake Superior No. 6, $23.50; Nos. 2 and 3, $24 and Nos. 4, 5 and 6, $25.50, with concessions for cash payments. Foreign irons are moving slowly. Manufactured iron is in fair demand at 2.05 @ 2.10c. Structural irons are moving more freely, at 2.75c. for tank and $3.60c. for beams. The demand for galvanized has fallen off. Black sheets continue active. Russian iron is scarce. Nails are weaker and less active, at $3 in car-load lots. Steel rails are dull, and inquiry has fallen off; prices are nominally $40. Ingot copper, 15½c.

COAL.

The anthracite coal trade is in better condition than it has been for several months. Demand for manufacturing purposes is improving, and there is an increased Western demand. An advance equal to 25c. per ton has taken place, through an advance of 10c. per ton tolls, and 10 to 15c. per ton according to size. The Lehigh and Schuylkill committees met recently, and fixed upon an advance for stove and small stove of 15c., and 10c on egg. Prices are now $3.15 for the one and $2.85 for the other. The advance in tolls took place on Monday. There is an active demand from the Northwest. It is growing rapidly, and occupies the entire capacity for shipment in that direction. The advance is acquiesced in by consumers generally.

The production is nearly three-quarters of a million tons per week, and this average will be maintained until the end of the year. Production up to last Saturday, 22,725,000 in round numbers.

The Pennsylvania Company carried eastward for week last reported 238,977 tons of coal and coke.

The Reading Company reports stocks at shipping ports light, and all of the collieries busily engaged in deliveries along the Atlantic Coast. Freights to Boston, $1.15@$1.25. To Providence, $1.10. The Eastern demand is heavy, and local requirements are coming in freely.

The bituminous trade is unusually dull, and several mines have suspended production because of the decline of mine prices to 70@80c. Last week's shipments, 98,075 tons. Cumberland shipments for last week reported, 59,148 tons; and for year, 1,857,000 tons. In Western Pennsylvania, a strike among the railroad miners is threatened, against the decision of the trade tribunal which had settled all difficulties.